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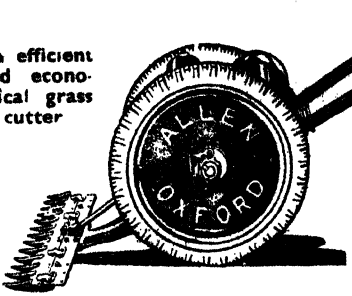

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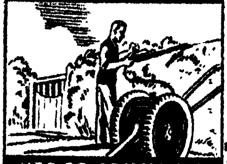
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THE RHODESIA

Agricultural Journal

Vol. XLVII. No. 1 January-February, 1950.

# Editorial

## Notes and Comments

### GWEBI COLLEGE OF AGRICULTURE

On Wednesday, 15th February, the Prime Minister of Southern Rhodesia, Sir Godfrey Huggins, officially opened the Gwebi Agricultural College.

The College which is situated 19 miles from Salisbury on 3,500 acres, offers a two-year Diploma Course in Agriculture to students between 17 and 20 years of age who have passed the Cambridge School Certificate and have had some farm experience.

The resident staff consists of the following:—
Principal: Dr. W. L. Fielding.

Lecturer in Animal Husbandry: Mr. D. P. Hanham.

Lecturer in Field Husbandry: Mr. D. L. Barnes.

Lecturer in Agricultural Engineering and Building Construction: Mr. C. T. Crosby.

Farm Superintendent: Mr. F. P. Orsmond.

Farm Manager: Mr. [illegible] J. Van Aswegan.

Stockman: Mr. W. V. Lane.

A Building Instructor and a Mechanic Instructor are being appointed. Lectures will also be given by Officers of the Department of Agriculture.

The main subjects in the curriculum are Animal Husbandry, Field Husbandry, Agricultural Engineering and Building Construction.

# EXTRACTS FROM EAST MALLING RESEARCH STATION ANNUAL REPORT, 1948

The Research Station Report is, as formerly, divided into 4 Sections:

Section I—Details of the Working of the Experimental Farm during the year.

Section II—A General Review of the Progress made with the Research Programme.

Section III—Detailed Accounts of Certain Experiments.

Section IV—Bulletins for Fruit Growers.

The Report includes an Appreciation of Sir Ronald Hatton, C.B.E., who was Director of East Malling from 1918-1948.

Although 1948, with its very wet June and August, was a bad summer for corn and hay, yet it was comparatively favourable for the fruit crop. The yields obtained, although much less than in 1947, were satisfactory. Frosts affected some of the smaller fruits, for example: strawberries and blackcurrants, resulting in poor yields. Raspberries, however, flourished and yielded a bumper crop. In spite of weather conditions arable crops were more successful here than in the North and West.

In the case of strawberries, a tested clone of the variety Auchincruive Climax (M.46) has now been issued as a Special Stock. In many nurseries there has been a big increase in Mild Virus in stocks of Royal Sovereign (M.40) and also eelworm has been prevalent in some cases. On account of this, arrangements have been made to substitute plants of a new re-selected clone, believed to be free from mild virus infection for this stock, for the 1950 special Stock Certificate.

The results of previous work carried out on virus 2 was published: " Resolution of Strawberry Virus Complexes. II. Virus 2 (mild yellow-edge Virus)"—I. W. Prentice. Ann. Appl. Biol., 1948, 35, 279-89.

This new re-selected clone has been raised with special eel worm control measures.

Work continued on the development of analytical methods for elements. It is essential that the methods used are applicable to small samples.

A progress report is being prepared on the work done in connection with detection of phosphorus, calcium, magnesium and manganese. As regards iron, no method has as yet been found which is sufficiently reliable to be adopted as a standard method, nor has a method sensitive enough for copper and zinc been found.

A new variety of apple is described in the Report, namely, Tydeman's Late Orange (formerly called Tydeman's Late Cox). This apple is derived from a cross between Laxton's Superb and Cox's Orange Pippin, and is regarded as a promising late maturing desert apple to follow Cox's Orange. The fruits are rather more oval in shape than those of Cox's Orange, and have a rich pleasant flavour. The fruits when picked are deep green, with a dull reddish-brown flush, and covered with a fine greyish russet. On ripening they turn to bright golden yellow, flushed with a rich orange to deep red, often with a few faint stripes. The skin is dotted over with small russet spots and patches. The flesh is not quite so juicy as that of a fully ripe Cox's Orange.

A chapter devoted to spraying in the fruit garden summarises the recent advances in the control of fruit pests. D.D.T. has replaced the arsenical sprays. It stresses how essential it is to spray thoroughly on all parts of fruit trees and each side of the leaves in order to make the spraying effective, and to use the proper spraying equipment, taking care to choose those insecticides and fungicides which have been approved by the Ministry of Agriculture.

# Some Rhodesian Plovers, Dikkops and Coursers

By D. G. H. PLOWES,
Matopos Research Station, Bulawayo

Members of this group are widely distributed throughout Africa, particularly in the southern region, and its members may be said to number among its most characteristic and important birds. They are mainly birds of the short open plains, but others occur in savanna veld, montaine grassland, flood plains, along sandy rivers or on the margins of swamps and dams.

Little research has been done on the biology of these birds, but all authorities are in agreement as to the insectivorous nature of their diet. No farmer has yet had an occasion to point an accusing finger at any one of them, and the need for their protection is universally recognised. Few other birds can be said to have such a notable credit balance in their favour.

Grasshoppers, ants, termites, small beetles and caterpillars probably constitute the bulk of their diet. In view of the present outbreak of army worm, it would be of interest to note what measure these birds play in the destruction of this pest. In the past, these birds helped to a very considerable extent in the suppression of locust swarms, particularly while they were still in the voetganger or hopper stage.

Prominent in the past in the suppression of locust invasions, was the Black-winged Pratincole (*Glareola nordmanni*) and its role in this respect earned it the name of " Klein Sprinkaanvoël " in Afrikaans. The following extract from a note in Andersson's " Birds of Damaraland," serves to indicate how useful this bird was in the past:

> " The principal enemy of these great swarms (of locusts), and valued friend of the Cape farmer, is the small locust bird. These birds come, I may say, in millions, attendant on the flying swarms of locusts; indeed, the appearance of a few of them is looked upon as a sure presage of the locust-swarms being at hand. Their mode of operation, as I saw it, was as follows: They intercept a portion of the swarm and form themselves into a ring of considerable height, regularly widening towards the top, so as to present the appearance of a revolving balloon or huge spinning top. They thus fly one over the other,

Temminck Courser on nest

Blacksmith Plover about to settle on the nest

Wattled Plover at nest

Treble-banded Sandplover

[Photographs by D. Plowes.

and hawking at the locusts within its limits. As their digestion, like that of all insectivorous birds, is very rapid, the form in which they thus enclose their prey is admirably adapted to enable the lower birds to escape the droppings of the upper birds. When they have consumed this portion of the swarm, they follow up the main body, and commence another attack, and so on, until night sets in and the birds happen to lose the swarm or the locusts are all devoured. At another time, when the country at Fort Peddie was suffering from the effects of a long drought and was overrun by unusual quantities of ants and grasshoppers, we were visited by thousands of these birds, which remained many days, devouring these pests."

Now that locust swarms are infrequently met with, these formerly numerous birds are becoming decidedly scarce. They are migrants from the Middle East and have not been recorded as breeding in Southern Africa.

Closely related to the Pratincoles, but terrestrial in habits, are the Coursers. The Bronze-wing Courser (*Rhinoptilus chalcopterus*) is a tall elegant bird, rather similar in colour to a Crowned Plover. A nocturnal bird, it is found in pairs, sleeping under bushes during the day. Much commoner especially in Matabeleland, is the smaller Temmincks Courser (*Cursorius temminckii*), a bird of open or sparsely-bushed thornveld. It is of a wandering disposition, appearing in the southern portion of the Colony after the first frosts and disappearing again shortly after the onset of the first rains, when the grass becomes too tall. (All birds of the plover tribe prefer short grass, as they then have a good view of possible enemies.) This Courser is particularly fond of freshly-burnt veld, and lays its two eggs among the blackened stubble, without any pretence of a nest, relying on the dark colour of the eggs to match the background, which they do most effectively. Shy birds, they move off at the first appearance of man, and in spite of their tawny colour, are most difficult to see against the burnt grass.

Both the Temminck Courser and the Crowned Plover (*Stephanibyx coronatus*) are alike in having a black eye-brow stripe, surmounted by white, and ending in a V at the back of the head. The pink legs and bill, and much larger size, coupled with the raucous voice which has given rise to the Afrikaans name of "Kiewietjie," easily serve to distinguish this plover from the Courser, and indeed, from any other member of the group.

Crowned Plovers are subject to local movements about which little is as yet known. On wintry, moonlight nights, the stillness of the air is often broken by their querulous calls, as the members of a straggling band seek to keep in touch with each other. By the ringing of chicks with aluminium bands (the South African Ornithological Society has commenced such a scheme), much useful information could be gained as to the extent and nature of their wanderings. At Matopos, these birds disappear partly or completely during the rainy season, to return again when conditions are more suitable.

The eggs are generally laid in September or October, but may be as early as the beginning of August. Some people believe that birds are endowed with a sixth sense which enables them to predict whether the coming season is going to be a good or a bad one, and that they regulate their laying accordingly. There may be substance in this; the author has frequently noticed that Crowned Plovers have nested early in years when the rains have come early, and vice versa. This aspect is worthy of further study, for, if there does happen to be a correlation between laying dates and the nature of the ensuing season, it might enable farmers to fortell the type of weather with some certainty for periods up to two months in advance. It is a well established fact that birds which normally nest after the commencement of rainy weather, do, in times of drought, lay much later than usual, and frequently, not at all. Furthermore, the size of the clutch is regulated, birds laying only one or two eggs instead of a normal three or four.

Rather similar to the Crowned Plover, but confined to the mist-belt of the Cape round to Umtali, is the Black-winged Plover (*Stephanibyx melanopterus*), whose familiar call in Natal and the Eastern Province has earned it the vernacular name of " Titihoy." It is usually to be found in small parties on grassy mountain slopes, particularly where sheep or cattle are herded.

Most of the birds that inhabit open veld are rather drab coloured, to render them as inconspicuous as possible. Bush and water-frequenting birds though, are often much more colourful, and this is the case with the Wattled and Blacksmith Plovers. These birds are always associated with water, though often ranging quite far from it out onto the open veld. Even more colourful, are the White-crowned and White-winged Plovers. Both are comparatively scarce over most of the Colony, being tropical birds confined to swamps studded with water-lilies, and large flood plains.

In Matabeleland, and other portions of Southern Africa where suitable conditions occur, the Blacksmith Plover (*Hoplopterus armatus*) is not uncommon in the vicinity of vleis and dams. This striking bird, with its black, slate and white plumage, is one of the most conspicuous of plovers, yet when sitting on eggs, in sparse, yellowed grass or on a mud-flat, it is surprisingly difficult to see. This is due to the colouration taking the form known as " disruptive patterning," a principle used in both World Wars to render shipping less conspicuous. The harsh clinking alarm notes, as of a hammer striking an anvil, are the derivation of the name " Blacksmith."

It is not commonly realised that Nature provides most birds with the ability to lay two or more times, should the first clutch of eggs come to grief. Were this not so, birds would long ago have disappeared from the face of the earth, as mortality among chicks and eggs is extraordinarily high. Snakes, monkeys, meerkats, predatory birds, man and the elements all combine to take terrific toll of nests and their contents. The number of eggs which a bird lays is frequently an indication of how successful the species has been in overcoming these adversities, and possibly too, to a lesser extent, is the ability to lay repeat clutches a measure of a species' success in this direction. A Blacksmith Plover that attempted to nest in the heart of Johannesburg laid three clutches in six weeks, the first two being taken shortly after they were laid. This provision of Nature makes egg-collecting less of a threat to birds than would at first appear, and accounts for the fact that birds are still found in abundance round schools where systematic egg-collecting has taken place over the last few decades.

In the illustration of the Wattled Plover (*Afribyx lateralis*), it will be seen that the nest contains but two eggs instead of the normal three or four. This is because the previous nest was destroyed by some predator, and the bird had to lay a second time, being then only capable of laying a reduced clutch. The illustration clearly shows the two wattles, one on either side of the beak, which adorn the face of this bird and give it a rather incongruous appearance. These wattles, together with the bill and legs, are a bright chrome yellow and are among the most distinguishing features of this species.

Yet another brightly marked water-loving member of the plover tribe, is the Treble-banded Sandplover (*Afroxyechus tricollaris*). This diminutive bird is to be seen on most sandy rivers, and on suitable dams and vleis. It occurs singly or in pairs, and though of no economic importance, is generally accorded protection out of sentiment. It has two black bands across the upper breast, and is brown above and white below. Scuttling along the water's edge, it pauses frequently, bobbing up and down the while in a nervous manner. It feeds in shallow water, and may help to account for mosquito larvae.

Formerly much sought after for the pot, the Cape Dikkop (*Burhinops capensis*) is now widely protected. This is a sandy-coloured bird, with dark brown spots, found sleeping in pairs under the shade of bushes during the day. The large yellow eyes indicate that it is nocturnal in habits, and this is confirmed by the melodious whistles so often heard at night in areas where these birds abound. One writer suspects them of taking a toll[illegible]rs. of mealies and grain, but this view is not confirmed or sh[illegible]n proby other authors. As they are slow breeders (they lay [illegible]ome form eggs), and with probably a very clean slate, they [illegible]eed. This is deserving of protection. Very similar except for a grey shoulder patch, is the Water Dikkop (*Oedicnemus vermiculatus*), which as the name implies, is always associated with water. Mainly a lowveld bird, it is particularly partial to large, dry sandy rivers.

Except perhaps in the vicinity of towns and in native reserves, most of the birds enumerated above are entirely unmolested, and do not require any special legislation for their protection.

Only those birds which are particularly rare, or especially sought after for some purpose or other, are ever likely to need such legislation. Most birds, particularly those frequently met with by man and known to be beneficial, are accorded sentimental protection. Legislation is unlikely ever to cause a marked increase of beneficial birds as a result of protective measures. At the most, it can restore birds up to the limit of their original population, but will not, as some people wishfully suggest, be the means of bringing their numbers so much above this mark as to be able to wipe out all insect pests within a generation or two. Nature has arrived at a carefully regulated balance over the course of countless ages, this balance being subject to minor fluctuations dependent on environmental and other factors. Important among these factors is the question of food: increase the supply of food, and those forms of life deriving their existence from that source will also increase, until such time as equilibrium is again reached.

Decrease in the number of predators upon a certain population, will automatically result in an increase of that population; decrease in the numbers of insect-eating birds will give rise to increased quantities of insects. Few farmers are so short-sighted as not to realise this; it is the townsman and the uneducated native in the Reserve who are the principal offenders in the wanton destruction of birds. Even so, there is little to show, except in a few isolated cases, that there has been any marked decrease in the numbers of birds in the Colony since European settlement. The future policy of bird preservation requires not so much to be based upon legislation, but rather on the cultivation of an enlightened public opinion.

# Factors Influencing Egg Quality on the Farm

By G. H. COOPER, Chief Poultry Officer

The egg is a highly perishable article under certain conditions and therefore in its journey from hen to consumer it must be handled in the best possible manner to ensure its arrival on the table or in the kitchen in good condition. The good producer will take a pride in marketing first quality eggs, and it will certainly be to his financial benefit to do so.

In Southern Rhodesia two essential factors that adversely affect the delivery of good eggs are:

(i) Distance and poor transport facilities.

(ii) High summer temperatures and low humidity.

The latter is the most important consideration, as the evidence of poor quality eggs during September to December indicates. .

During the hot months the quality of eggshells deteriorates considerably, due to the lower calcium-carrying capacity of the hen's blood at high temperatures and the evaporation of moisture from the cells of the shell, which is indicated by a mottled appearance when candled. Poor quality shells mean more breakages and higher evaporation. Therefore, while it is essential to pay strict attention to the practical factors which influence egg quality at all times, the farmer must be particularly careful during the period September to December.

**Feed.** The feed is important in its relation to egg quality. If the feed is lacking in vitamins or minerals the egg will also be deficient, and whilst this may not affect its keeping quality, it is certainly of lower value. The farmer feeding a registered brand of feed or properly balanced ration will produce satisfactory eggs in this respet. The amount of green feed available, either succulent or in dried meal form, will to a large extent govern the value and colour of the yolk. Yellow maize will also deepen the yolk colour.

Certain feeds are injurious in one way or another, and details of these can be obtained, but generally speaking the feed will not affect the keeping quality of the egg as much as other factors. It is essential however, in order both to achieve maximum production and procure strong shells, to feed lime in some form to all laying stock quite apart from that in the feed. This is best supplied by good quality oyster shell or other marine shell. Limestone grit is also used, but the consumption is rarely as high as marine shells, which indicates a preference for the former. The marine shell should be placed in a separate receptacle available to the birds at all times.

For birds in intensive houses and especially batteries where direct sunlight is limited, the addition of 1 per cent. of fish liver oil to the mash is essential for the assimilation of the calcium, and it is considered good practice to feed it to layers under any circumstances.

**Nests.** The nest where the egg is laid is important, for if laid in a filthy manure-contaminated nest, bacteria will at once be in a position to cause deterioration. Nests therefore should be clean and contain clean nest litter which will not stain the damp egg when laid. The material should be as inert as possible and free from any odour which may be imparted to the egg. Care must be exercised when nests are painted with "coal tar" type preparations, and strong-smelling insecticides, particularly Benzene Hexachloride, should not be used in nests or musty-flavoured eggs will result. Excellent nesting materials are:

(i) Fine Vermiculite; (ii) Clean deal shavings; (iii) Cut clean grass chaff or native-made grass mats; (iv) Shell grit; (v) Clean river sand.

Individual nests should be 11" x 11" x 15" deep for all breeds. They should be in a sheltered, cool position, and one nest should be provided for every ten hens at least. Community nests for commercial flocks are preferred as they are darker, which ensures less trouble from vent picking, egg eating, broken or dirty eggs. A nest 8' 6" long by 2' wide, 1' high in front, and 2' 6" at the back, will be large enough for 100 layers. The top is sloping to prevent perching, and a hinged lid is provided for easy collection, removal of broodies, cleaning, etc. The entrances are at either end, consisting of circular or square holes 9" across, allowing 4" at the bottom to retain the litter. The back may be of wire netting for ventilation, and the nest is placed up against an end wall of the laying house. It should be 18" from floor level and alighting boards provided at opposite entrances. One partition may be placed across the centre of the nest.

**Laying House Management.** In so far as eggs are concerned, this consists of ensuring that the nest and nesting material is clean and sweet at all times, and in addition:

(i) Removal of broody birds every evening as a regular practice.

(ii) collection of eggs three times daily in winter and four times daily, or more, in summer.

When collecting eggs the best receptacle to use is a diamond mesh wire basket (similar to a wire wastepaper basket) because it is of the greatest importance to the keeping quality that the animal heat should be removed as quickly as possible and in this type of basket air can pass through and cool the eggs quickly. If tins are used, ¾" holes should be punched all around to permit air circulation. Two baskets should be used. In one, place all clean, sound, shelled eggs and in the other all soiled, weak-shelled or damaged eggs, also any eggs found on the floor, which may be old and therefore must be tested before packing. If all eggs are placed in one basket, clean eggs may be soiled by dirty ones or a weak one break and mess the whole collection. Two baskets therefore save time and provide more first quality eggs.

The eggs should be left in the baskets or laid out in trays with ½" wire mesh bottom supported on legs 5" high in the coolest position for several hours until quite cool. Eggs still warm if packed in boxes will deteriorate in quality much faster than eggs packed when as cool as possible.

Eggs should not be removed from nests and placed in receptacles in the house as they will be too hot in summer and become dusty.

On hot days the laying house should be kept as cool as possible by opening back cleaning doors beneath perches to allow for a floor draught. If the temperature approaches 100°F., spraying water over the litter and birds with a stirrup pump will cool the house, and save birds from heat stroke.

An aluminium roof or white painted roof if of iron or asbestos will keep the poultry house cooler.

**Fertile Eggs.** Germ development in a fertile egg will commence at 68°F. It is therefore evident that during the spring and summer months slow development is taking place day and night. Many germs die in this process and the egg then rots quickly. If this does not occur at once, it is likely to later in storage. At best an enlarged germinal disc is evident on the yolk when opened.

It is therefore very important to dispense with all male birds from commercial laying flocks. If hens have been used as breeders, the males must be removed directly the breeding season is over and the eggs are to be marketed for consumption. Normally this should occur early in September. Infertile eggs will keep much better under any conditions.

**Produce Clean Eggs.** The higher the percentage of eggs clean from the nest that are produced, the better, for several reasons, not least of which is the labour and time entailed in cleaning dirty eggs. The nest and the collection in two baskets described previously will ensure the production of the maximum number of clean eggs. In wet weather confine hens in semi-intensive houses to ensure the production of clean eggs. When an egg is washed, the protective coating on the shell is removed and harmful bacteria are more likely to get into the egg and cause deterioration.

Eggs with slight dry marks on them should not be washed, but the marks may frequently be removed with sandpaper or wire wool pot cleaner.

Eggs that have to be washed may be cleaned in a brush egg washer if numerous enough or by hand. In either case the water should be kept clean by constant changing, otherwise harmful bacteria will be smeared over all the eggs.

The washing water should be hot, preferably 140-150°F., which will tend to force bacteria out rather than in, which is the case if cold water is used. For the best results wash eggs under a running hot water tap so that the water is continually changing. Wash them the day they are laid. Do not use any cleaning substance as this may result in absorbed flavours. Dry the eggs by placing them in a drying rack or wire tray. No washing or drying rag should be used, but if it is, a new clean one should be used daily. The washing rag is usually teeming with harmful bacteria. Never pack eggs until quite dry.

Finally, very dirty eggs should not be marketed but used on the farm, and remember that clean eggs that have never been dirty are the best " cleaned " eggs.

**Holding Eggs.** The eggs brought from the laying houses should be held in the most favourable conditions possible before despatch.

The holding conditions require an airy room whose temperature is not above 60°F. with humidity about 75 per cent. These conditions are best obtained on the farm in a cellar cut into an anthill, hillside, or simply dug in the ground. The roof may be made of curved asbestos sheeting with earth banked on top. A small window at one end with gauze in place of glass, with a stable door at the other will allow a cool draught without excess wind. Wooden racks on the floor will keep cases and egg baskets off the earth. In hot dry weather damp hessian should be hung in the doorway, and the floor may be kept moist, but care must be taken that neither eggs, fillers, nor boxes become wet. To prevent wet hessian and sacks becoming mouldy, sprinkle a little powdered bluestone on them. If electricity is available, a fan blowing through damp hessian at the window is an advantage. No strong smelling articles such as onions, etc., should be stored in the egg cellar. An egg-holding cellar or cooler can be cheaply constructed and will result in egg quality being maintained until eggs are marketed, especially when, owing to distance, this can only be done once per week, as in some instances is unfortunately the case.

**Packing and Despatching Eggs.** Eggs should be sent to the market at least twice weekly.

The egg fillers in particular should be clean, and if contaminated with broken egg should not be used, neither should weak partitions, which may result in breakages.

Owing to expense, dirty fillers may have to be scraped and cleaned for future use. After cleaning, place in the hot sun, which is the best steriliser, but do not use until cool. The cases should also be kept cool, clean and sweet smelling.

Always pack eggs with the point downwards and the blunt end upwards.

Pack large eggs along the edges where fillers are more flexible if special fillers are not available. Do not pack cracked eggs ever; if numerous, attention should be paid to nests, feeding, handling, etc., to avoid this loss.

When packing eggs, place the unwashed, infertile eggs together and put a note to this effect on top of the case. Place washed and fertile eggs together and indicate this fact also.

By doing this the buyer knows or should know that the washed or fertile eggs must be sold at once, whereas the unwashed infertiles are his best quality which may be expected under normal conditions to hold better. Further, pack brown eggs and white eggs in separate cases or sections of a case. This is important for the grader, as it is difficult to adjust the sight quickly when testing eggs and at times mixed colours result in brown eggs being rejected as "full of blood" or white eggs which are "full of blood" being passed as sound brown eggs on mechanical graders.

If the egg cellar is below 60°F., remove eggs to be despatched that day early in the morning to prevent sweating. Keep egg cases at all times in the shade and in a cool position. If they are to be transported in an open vehicle, place damp sacks over the cases. At all times handle cases with care to ensure safe delivery.

If you deliver direct to a retailer or consumer, check up on his holding conditions and the length of time he keeps eggs before sale, for if these points are not appreciated by him he will blame you for bad or stale eggs.

# A Survey of the Fire-Cured Tobacco Industry Conducted During 1949

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By J. C. COLLINS, B.Sc. (Edin.), Tobacco Officer

*(Abridged from a Report published and issued by the Standing Fire-Cured Tobacco Committee of Southern Rhodesia)*

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In response to a request made to the Department of Agriculture by the Standing Fire-Cured Tobacco Commitee of Southern Rhodesia, for technical assistance to be rendered to the growers of fire-cured tobacco, Mr. J. C. Collins, Government Tobacco Officer, was instructed to visit the Shamva-Bindura area during each phase of the crop to assist growers with advice and to investigate the various methods employed, in order to bring about improvement in quality, and to effect uniformity in manipulation and packing. Furthermore, the information so obtained would be of assistance in formulating a programme for future research.

As the full report is too lengthy for inclusion in the Journal, only the most salient features have been extracted for publication herein:

The fire-cured industry, with the exception of a few individual crops, is centred in the Shamva area where maize is the principal agricultural product. During the last three seasons the district has been afflicted by drought with the result that the maize crop has suffered extremely badly, the average yield per acre having fallen very considerably.

The fire-cured crop, however, has withstood the drought very much better than the maize and although there is no comparison in the acreages planted to the two crops, it is the former, on the smaller acreage which has enabled farmers to weather three successive seasons of drought.

The better grades of leaf find their way to overseas markets, the principal one of which by far, and in some years the only one, is the United Kingdom. It is interesting to note that in 1947 and again in 1948, Norway imported 10,060 and 10,040 lbs. of our leaf respectively. This is the first European country, other than the United Kingdom, to purchase Rhodesian fire-cured leaf for many years.

The increasing demand for our leaf by other countries is best envisaged by the resultant fall in purchases for the local market. Normally the local market absorbed a good 50 per cent. of the crop, but during the last two seasons this percentage has dropped to 37.6 and 29.9 respectively. This is a healthy sign.

In general, the United Kingdom desires a lighter-coloured, and therefore a more lightly-smoked, leaf. The local and Bechuanaland markets, on the other hand, are not so particular regarding colour or quality.

Although the local market absorbs a high proportion of the crop, it is the United Kingdom market which induces and maintains the higher price level and it is this market, therefore, which growers must aim at holding and expanding.

In Part II of the main report, soil conditions and the methods employed by 23 growers, are described in detail in the following sequence: Soil, Seed, Rotation, Spacing, Manurial Treatment, Field Routine, Priming and Topping, Harvesting, Tying, Curing, Grading and Auction Floor Reports.

With regard to this last item, some explanation is required. With the intention of improving the quality of the leaf and the manner of its presentation for sale, the Fire-Cured Tobacco Committee understook the task of presenting to each grower who so wished, a report on each individual consignment. The factors covered by the reports include comments on grading, tying, condition and quality.

Undoubtedly the reports achieved their purpose, for the general standard of manipulation was greatly improved and was commented on favourably by warehousemen and buyers. However, there is still much room for further improvement particularly in regard to "condition."

In Part III, the soil conditions and methods described in Part II are discussed, item by item, and recommendations are submitted when the data permits of a definite deduction being made.

Growers were divided into three groups on the basis of the quality of the leaf produced by them. Only two qualified for Group I, whilst 13 were placed in Group II which included crops of average quality, and 8 in Group III—crops below average in quality.

Very briefly, the following observations were made:

**Soil.** By considering the quality of each individual crop in relation to soil type, it appears that clay soils are preferable to sandy clay loams. However, these latter, if very fine-grained, are capable of producing good quality tobacco.

There appears to be a very marked correlation between quality and the calcium content of the soil; for instance, the two best crops were grown on soils containing 33 and 30 mgm. per cent. of calcium, whereas the poorest crops were grown on soils which were low in calcium (3 mgm. per cent.). In general, as the calcium content of the soil increased, so the quality of the leaf improved.

Before any set action can be advocated on this finding, it is necessary that the idea be proved by experimentation, and ways and means be found to adapt it to practical farming practice.

**Seed.** " Western " is the only variety now grown in the Colony. Two growers import their seed each year from Nyasaland, but otherwise growers either select seed from their own crops or else obtain their supplies from one or other of six persons who dispose of seed commercially or by way of presentation. All six go to much trouble in selecting plants conscientiously, but, unfortunately however, some of them are not sufficiently experienced in plant breeding to select a really desirable type.

Allegedly " Western " is the only variety being grown, but on several farms field observations reveal a number of plants which, judging by leaf characteristics are not truly " Western." There is at least one seed selector who fully appreciated the importance of this point and who is careful to avoid selecting such plants, but there are others who are attracted by the rather wider leaf, and in ignorance of the characteristics of Western are selecting such plants.

Whilst the industry is so localised and the number of growers so limited, the Committee would be well advised to consider some scheme to ensure a measure of control over seed selection and disposal. This is an extremely important point and one which should receive early consideration, because once the industry expands and extends to other areas, the more difficult will it be to effect the necessary control.

**Crop Rotation.** So many factors are involved, including the very important one of soil type, that it is impossible from a survey of this nature to determine which rotation is best suited to the production of quality and yield in fire-cured leaf.

It is interesting to note that in the twenty-four cases examined, tobacco follows maize sixteen times, a green manure crop three times, sunn hemp stubble once, velvet bean hay twice, weed fallow once and cotton once.

Of the five best quality crops, three followed maize, one followed velvet bean hay and one followed sunn hemp ploughed under. In the case of the tobacco following sunn hemp, the soil was a very fine-grained sandy clay loam, whereas in the other instances it was a heavy clay loam. This observation might be of interest to growers on the somewhat lighter soils.

Unfortunately no conclusive evidence is available from the solitary case in which tobacco followed cotton, as the crop was grown on a sandy clay loam low in calcium, and so the poorness of the crop might be attributable more to soil or to some other factor rather than to the rotation practised.

**Spacing.** Although 17 per cent. of the growers favour a spacing of 3′ x 3′, the majority consider this to be too close for fire-cured tobacco. A certain few are satisfied from personal experience that this contention is correct. It is not so much the question of the incidence of disease which promotes this opinion, as the damage sustained by the plants during reaping.

The most interesting of the spacings tried, are the two in which the distance between the rows alternate whilst the spacing between plants in the row, remains constant.

In this regard particular attention was paid to the one in which the rows alternate at intervals of 2′ 6″ and 4′ 6″, whilst the distance between the plants in the row remains constant at 3′. The principal points to emerge are:

(1) There is no evidence of "border" effect. The plants grew well and without any tendency to rankness or flaring.

(2) As there is a "path" 4′ 6″ wide on each side of every set of two rows, labourers have freedom of movement and consequently losses through damage must be greatly reduced.

(3) Compared with a spacing of 3′ x 3′, there are 700 less plants per acre, representing a decrease of 14 per cent. The yield per acre, however, was high.

(4) In the preparation of the land for planting on ridges, this method of spacing is more economical than making the ridges 3′ apart as it effects a saving of 35,000 yards of ridging in 50 acres.

The yardage of ridging is identical with ridges set 3′ 6″ apart.

(5) At the time of reaping, an economy in labour can be achieved by eliminating the necessity for waiters, as crates can be placed along the 4′ 6″ paths at intervals convenient to the reapers.

## Manurial Treatment

**Rate of Application.** With the exception of one grower who uses Standad Tobacco "A" Mixture(P.N.K. 12:6:8), all others use Standard Tobacco "B" Mixture (PNK 13:3:8). The rates of application vary from 150 to 450 lbs. per acre. Only three persons apply compost to their tobacco and two give a dressing of raw rock phosphate in addition to the "B" Mixture.

Judging by the growth of the crop and the quality of the leaf produced during the season under review, it would appear that applications of less than 250 lbs. per acre are inadequte.

Of the five best crops grown, two were fertilised at 300 lbs. per acre, two at 350 lbs. per acre, and one at 400 lbs. per acre plus compost and 200 lbs. per acre of Raw Rock Phosphate.

**Times of Application.** Only one grower applies all the fertiliser before planting, while seven apply part before and part after planting, and the remaining fifteen give the whole lot after planting.

As with flue-cured tobacco, so with fire-cured, it is fundamentally important that the growth of the plant should proceed steadily without any set-back and this can best be achieved by giving the fertiliser in fractional applications rather than in one instalment.

The intervals at which the fertiliser should be applied are, of course, dependent principally on the amount and the intensity of the precipitation of the rainfall. Under normal circumstances the best results may be expected when it is applied in three instalments, e.g., ⅓ applied at, or just before planting; ⅓ three to four weeks after planting; and ⅓ about six weeks after planting.

Naturally, if heavy rain persists, it might be advisable to set forward the times for the application of the two top dressings. The application of the top dressings must not be delayed once the plants show signs of food shortage.

**Method of Application.** In the absence of specific data for fire-cured tobacco, it is expedient to consider the results obtained with flue-cured.

The following treatments have been experimented with:

(a) The field is ridged and the fertiliser is distributed in holes on the ridge around the grass markers which are used to indicate the position each plant is to occupy.

(b) The fertiliser is distributed in circles of 12″ diameter and the field is then hilled over the fertiliser.

(c) The fertiliser is drilled in the row and the field is then ridged over it.

(d) The fertiliser is broadcast before planting (at a higher rate per acre than for any of the other methods).

(e) The fertiliser is incorporated in the soil around the plants which were planted on hills.

(f) The fertiliser is placed in small holes made with a pointed stick adjacent to the plants which were planted on ridges.

No significant difference has been observed between treatments, but the determining factor for success, appears to be the thorough incorporation of the fertiliser with the soil in such a way that it is readily available to all the feeding roots. In this regard, although treatment (f) does not give significantly better or worse results than treatment (e), it is only reasonable to assume that the latter method renders the fertiliser "more available to all the feeding roots," regardless of whether the plants were planted on hills or on ridges.

**Field Routine.** This Section really resolves on whether the crop is planted on the flat, or on ridges, or on hills.

6 growers plant on the flat, and later throw up hills around the plants.

3 growers plant on ridges.

3 growers plant on ridges which are later converted into hills.

9 growers plant on hills.

1 grower plants on ridges until the end of December, and from January onwards he plants on the flat and throws up ridges later when cultivating.

1 grower plants on hills until the end of December and from January onwards he plants on the flat and hills up later.

Selection between ridges and hills is primarily a question of the personal choice of the individual as there is no fundamental difference between them provided each is properly constructed.

**Priming and Topping.** A recent innovation in the fire-cured industry, is the practice by certain growers of curing leaves which would normally be primed and discarded at the time of topping. It is a debatable point as to whether such action is economically sound. No reliable opinion can be vouchsafed in the absence of detailed crop statistics, including information on prices realised.

Certain leading growers have expressed the fear that this practice will be harmful to the industry by placing on the market leaf which must obviously be poor in quality. This point was discussed with members of the trade section who aver that if there is a demand for primings, as apparently there is, why not cure and sell them?

The answer clarifies one point of view, but what the grower must know is whether leaving primings or sand lugs on the plant for a longer period than normal, in order that they ripen for curing, reduces the weight of leaf proper, and if so, to what extent and value. This can only be determined by scientifically conducted experiments.

A number of growers are following the example of one who buries at the foot of the plant the leaves removed at the initial priming. The object is that they will decompose and provide food material.

This practice is a modification of the American system of obviating priming by throwing up the soil at the time of cultivation so as to bury the priming leaves. With a disease-free crop there is probably no danger, but if diseased leaves are so covered, they are liable to form a nucleus for further infection.

The best results are obtained when the initial priming is carried out about four weeks after transplanting.. One research worker* has found that this operation is followed by a marked greening of the leaves coincidental with a check in growth, indicating a possible upset in the nitrogen balance of the plant, which, in turn, may render it more susceptible to bacterial diseases. Until this finding has been established by further research, growers are advised to prime.

**Topping.** During the 1948-49 season, the "early flower" stage was favoured more than the "bud stage" or the "full flower" stage, and the number of leaves remaining on well-grown plants after they had been topped, varied from eight to twenty-three. This number, of course, depended largely on whether or not the plant had been primed.

Naturally, no hard and fast rule can be made to apply to topping, as it is so dependent upon the standard of growth made

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*** I. P. Norval—Annual Reports of Tobacco Research Board for 1940 and 1941.**

by the plant and on seasonal conditions, but it is interesting to note the methods employed in the case of seven of the best quality crops:

| Priming at Time of Topping | Stage of Topping | Nature of Topping | No. of Leaves Remaining |
|---|---|---|---|
| High ...... ...... | Between bud and full flower ...... ...... ...... ...... | Low ...... ...... | 10-12 |
| No ...... ...... ...... | Full flower ...... ...... ...... | Low ...... ...... | 12-15 |
| Fairly high ...... | Full flower ...... ...... ...... | Fairly low ...... | 13-14 |
| High ...... ...... | Early flower ...... ...... ...... | Low ...... ...... | 9-11 |
| High* ...... ...... | Full flower† ...... ...... ...... <br> Bud stage‡ ...... ...... ...... | Low ...... ...... | 10-12 |
| High ...... ...... | Full flower† ...... ...... ...... <br> Early flower‡ ...... ...... ...... | Low ...... ...... | 10-12 |
| High ...... ...... | Early flower ...... ...... ...... | Low ...... ...... | 8-10 |

* By priming a week after topping he finds that primed leaves cure better than if reaped at the time of topping.

† Early in Season.

‡ Late in Season.

For illustration of methods which were successful during the season under review, see Plates I, II, and III.

The attention of growers is drawn to the fact that the stage at which the plant is topped, is of as great importance, if not more important, than the height to which it is topped.

**Seed Selection.** Much has already been said on this subject in the Section on "Seed." Suffice it to say here, that when selecting a plant for seed, the following points must be observed:

(1) It must be true to varietal characteristics. In the case of "Western" this means a leaf which is relatively long and moderately wide as is shown in Plate IV (left), and NOT a rounded leaf as depicted in Plate IV (right).

(2) The plant should have grown out well and be free from disease. In selecting for vigour do not choose a plant which shows a tendency to grow rank, and be careful to observe that it has not received any favourable treatment through being grown near an anthill or having received an additional amount of fertiliser; or extra light, air and food material through being more widely spaced than the average spacing for the field.

(3) It should possess a large number of leaves. Leaves of good length should be carried well up the plant. The midribs and veins should not be coarse.

PLATE I

Grower No. 1—*Left*: Stage of topping
*Right*: Same plant primed and topped

PLATE II

Grower No. 23:
Plant primed and topped

PLATE III

Grower No. 14—*Left*: Stage of topping
*Right*: Same plant topped and primed

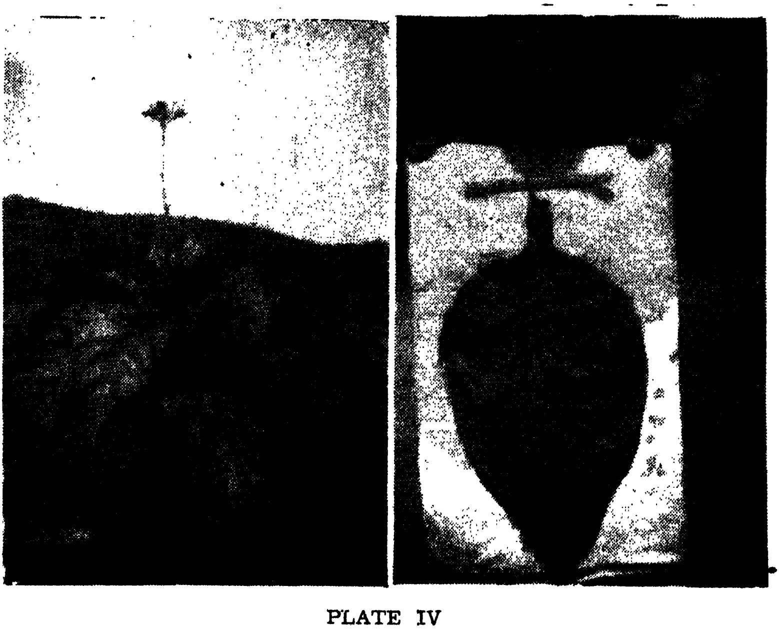

PLATE IV

*Right*: Leaf shape too "rounded" to be characteristic of "Western"
*Left*: Leaf shape typically "Western" variety

PLATE V

A hand which has been correctly tied

(4) The plants should be bagged before the flowers open and the flower heads should be examined periodically to see that they are free from insect pests, and that the bags are intact and securely fastened in such a manner as to allow the flower to develop freely.

(5) As the season progresses, plants which are not approaching the ideal must be eliminated. This will entail at least three major inspections for selection during the Season.

**Harvesting.** There are two methods of harvesting, the one is by splitting the stalk longitudinally and severing it above ground level, and the other is by the single leaf or priming method which entails the removal of leaves individually as they ripen. One or more leaves may be removed at a time.

For very obvious reasons the latter method ensures greater uniformity in the degree of ripeness of the leaves harvested; nevertheless, the pros and cons of the whole-plant method should be closely considered. The principal advantages are:

(a) It effects an economy in both time and labour for reaping.

(b) There are no stalks to remove after harvesting, and so

(c) If desired, ploughing can immediately follow harvesting.

The main disadvantages are:

(a) A certain lack of uniformity in the degree of ripeness between the different leaves on the stalk. In fire-cured tobacco this is not such a serious handicap.

(b) The cured leaves have to be removed from the stalk preparatory to being graded. This is a more onerous task than removing the leaves from a living plant.

(c) Greater organisation is required during grading to keep the different types of leaf separate.

(d) A possible reduction in the weight of the cured leaf, as, during the curing process there is a movement of food material from the leaves to the stalk, with the result that the leaves sustain a certain loss in weight. Owing, however, to the stalk having been split at the time of harvesting, the extent of this translocation will be somewhat limited and therefore the loss in weight will be nowhere nearly as great as would otherwise be expected.

Furthermore, with a range of temperatures such as is used by grower No. 14 (who is one of two persons who favours curing on the stalk), it is quite probable that the loss in weight would be no greater than it would be had the leaves been reaped by the single leaf or priming method.

**Curing.** Although individual growers might introduce minor modifications, the general principles underlying the whole principle of curing, are constant throughout.

It should suffice, therefore, merely to emphasise certain essential points which are often overlooked:

(1) Whilst the atmosphere is sufficiently moist to enable curing to proceed normally, the barn should not be packed too tightly. As a rough guide the sticks should be spaced about 9″ apart on the tiers. In an over-packed barn there is insufficient circulation of air between the sticks resulting in over-sweating and tarring.

Late in the curing season when the atmosphere is relatively dry, it is often necessary to reduce the interval between sticks.

(2) The barn should be ventilated the moment the leaf starts feeling unduly moist to the touch. The extent to which the ventilators should be opened will, of course, depend upon the moisture content of the barn and the humidity of the atmosphere outside.

Many persons who are most efficient at curing, advocate ventilation throughout the colouring stage; that is, the ventilators are opened to an appropriate extent the moment smoke is introduced into the barn.

(3) The normal practice is for the smoke fires to be extinguished at night, and for the ventilators and door to be opened for at least an hour each evening (when the fires are drawn) in order to allow the barn to cool down. Weather permitting, the ventilators could be left open all night.

(4) The principal buyers for the export market do not favour leaf which has been heavily smoked.

The volume of smoke should be sufficiently light to enable one just to see across the barn.

(5) Where only flues are used for drying the leaf, and not open fires, the quality of the cured leaf is enhanced by reducing the chances of over-smoking and curtailing the deposit of soot on the surface of the leaf.

**Grading.** If it is not expedient to grade the contents of each barn seperately, then care should be taken to see that each bulk will contain only leaf which is similar in type. If this is done properly, the whole operation of grading is greatly simplified by introducing a certain amount of uniformity in relation to texture, length and colour.

Grading must be based on colour, length and texture. The lighter or cinnamon shades of leaf must not be mixed with the darker brown or chocolate shades. Similarly, differentiation must be made between these latter shades and undesirable "black" leaf. Yellow mottled leaf must be kept seperate. So also must green leaf.

Each colour group should be sorted into at least four main divisions on the basis of length, as, for example, long leaf 22″ and longer; medium leaf 18-21″; short leaf 14-17″; and very short leaf under 14″.

As far as texture is concerned, differentiation must be made between heavy-bodied leaf and light-bodied or papery leaf. (The colour factor will largely help to determine this.) In certain seasons, and in certain crops, a third category should be considered, viz., harsh leaf.

**Presentation for Sale.** Too much emphasis cannot be laid on the importance of submitting neat and uniform bales for sale. Of recent years certain growers had become so negligent about the way in which their crops were graded and baled, that the industry in general was subjected to severe criticism by buyers and warehousemen. It is a most encouraging feature, however, that the Committee's action in reporting to growers on the quality and standard of manipulation of their individual consignments, has done much to improve matters.

The improvement has been so marked that frequently it has been commented upon by buyers. The principal faults still occurring are:

(a) Packing green leaf in the same bale as coloured leaf.

(b) Submitting bales in too high condition.

(c) Bad tying.

Leaf which cures out green is leaf which was not fully ripe at the time of harvesting and in consequence is bitter, harsh and undesirable. It follows, therefore, that if it is packed in the same bale as coloured leaf, it will detract from the value of the latter.

To show to advantage, fire-cured tobacco must be in slightly higher condition than flue-cured Virginia, but this does not mean that it should be wet! This question of condition is an all important one and growers who persist in submitting for sale bales which are in too high condition, will, in the long run, not only harm themselves, but do irreparable damage to the entire Rhodesian industry.

Before the 1950 sales season opens, it would be advisable to introduce a formula on similar lines to the one which applies to flue-cured Virginia, and which would indicate to growers the correct weight of a bale when pressed to a particular depth.

As far as tying is concerned, the main faults are:

(a) Butts of hands too large, due to too many leaves being tied in a hand, or, as is more often the case, the butts not being tied firmly enough.

(b) The tie band being not deep enough, or else being far too deep.

Neatly tied hands are a most important factor in enhancing the appearance of a bale. Plate V depicts a properly tied hand. The butts should measure about 1″ across and the binder should start at the extreme end of the butt and continue for 1½-2″ up the band. Bind firmly.

# Grass Ensilage

## Notes on British Methods which might be Applicable in Rhodesia

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Many of us have spent delightful moments reading through old books about farming forty, fifty or a hundred years ago. Amused sometimes by the primitive methods employed by our forefathers; interested in the train of thought of the pioneers, but often amazed to find that some so-called modern practices were advocated and implemented long ago with success. We wonder why they were never further developed or why they fell into disfavour and disuse. Quite often perhaps because the machinery available was inadequate or that some vital point was overlooked. Mr. C. M. Lennard, Nuffield Scholar, mentions in his Notes, which appeared in the " Rhodesian Farmer," the methods of grass ensilage being used in Britain today, it seemed hardly possible that they had not been tried in Rhodesia. Yet it was difficult to find reports of farmers who had made or were making grass silage.

Let us therefore search back in the old literature—yes, in 1931, Major H. G. Mundy gave an excellent account of the place of grass silage in the management of pastures and its value as a succulent feed for Rhodesia's long dry season. The present methods used in Britain are not new as Major Mundy quotes they were being used before 1874 in Austro-Hungary. Major Mundy also gives a full account of the various methods tried out in Rhodesia, they are those which are so popular in the United Kingdom today. Why was it then that the advice given was not accepted, or if it was, why has it been discontinued? Perhaps for the same reason the farmers in Great Britain tried and gave up, were persuaded to try again, and, by and large, up to 1944 did not like making grass silage. The product, after much hard work, was so often of inferior quality, and usually there was far too much wastage round the sides of the silos. Yet today a large number of farmers in Britain are making grass silage with crude protein values from 10 per cent. to 29 per cent. of dry matter at a cost of from 30s. to 45s. per ton. The winter keep and protein shortage problems are thus gradually becoming less acute. The advent of modern machinery has enabled the farmer of today, assisted by the research worker, to overcome the difficulties of the past. The minor modifications in technique evolved in Britain should be applicable in Rhodesia.

First of all it must be admitted that in most cases the grass silage which could be made in Rhodesia would not have as high a protein content as that obtainable in Britain—due to the lack of legumes. Those farmers who have kikuyu should be able to obtain up to 20 per cent. crude protein if not higher. Let us look, however, at some of the analysis figures for ensilage given by the Chief Chemist and quoted by Major Mundy, and the figures for hay given by Dr. H. Weinmann, Pasture Research Chemist.

**Kind of Silage**

| | Blue grass (Andropogon gayanus) | Veld Grass | Maize | Maize and Velvet Bean | Hay from sandveld |
|---|---|---|---|---|---|
| Crude protein | 10.69 | 6.15 | 7.12 | 11.04 | 5.05 |
| Ash ...... ...... | 6.68 | 12.30 | 4.96 | 3.35 | 6.25 |
| Ether Extract | 2.16 | 1.88 | 5.75 | 4.11 | 1.10 |
| Fibre ...... ...... | 39.86 | 38.62 | 9.59 | 13.98 | 37.40 |
| Carbohydrates by difference | 40.67 | 41.05 | 72.58 | 67.52 | 50.20 |

The above figures are calculated on 100 per cent. dry matter basis.

There is no need to stress the difficulties of hay making or the excessive loss of feeding value of grass cut and cured in Rhodesia. One or two farmers in the country are known to have been making grass silage, with very satisfactory results, over a period of years. Others may have made it, and the Pasture Research Division would be very grateful to hear from all those who have made grass silage in Rhodesia—so if you have any information please send it to Grassland Research Station, Private Bag 1, Marandellas.

For those who are interested in the various chemical changes which take place in ensilage, Dr. P. D. Henning, of Stellenbosch, gives a clear and full account in "Farming in South Africa", May, 1949. Quite often, however, several chemical changes take place in different layers of the silo at the same time, especially in those which are over six feet high. If the farmer remembers that when a plant is cut and then has access to both air and moisture it will decay. It can be preserved as in haymaking by eliminating the moisture and in ensilage by eliminating the air.

It is in the elimination of the air that the advent of modern machinery has helped to ensure successful silage making. The other advantages are speed and reduction of manual labour—which, be it white or be it black, is not popular.

The writer has had a considerable amount of experience of grass ensilage in the United Kingdom and feels that it should be possible to adapt modern British technique to Rhodesian conditions. The British method therefore is outlined below with modifications or additions suggested by Rhodesian farmers who have made grass silage.

British names given to the various types of silos may cause a little confusion so more explanatory titles will be given:

**The Trench Silo**—Major Mundy describes this under the name Hillside Silo, and is perhaps the most popular type in Britain, with its modification, the Clamp Silo. The siting of the trench is very important from an economic point of view. The time when the greatest speed is required and the work the heaviest is when the grass is cut until it is put into the silo, as it must not lose too much moisture during these operations. Therefore, it is an advantage to site the silo near the land on which the grass, to be ensiled, is growing. The advantages are a shorter distance to cart the heavy green material, and hence less wilting, as well as the whole of the labour force employed being under the eye of the supervisor. Even if the resultant silage is to be fed elsewhere, it only means the odd load every day or two to be moved. A site is chosen which ensures that the bottom of the trench will not be under water. Thus on a free draining, sandy soil, almost anywhere will do. On heavier soils a gentle slope enables the trench to drain easily, which will permit a tractor and trailer to pass through it. The width at the base of the trench should be 14 feet with 1-in-10 outward slope from the vertical, for the sides. The sloping sides are of extreme importance, because as the material in a silo settles it tends to contract away from the sides. Thus air can percolate and rotting takes place no matter how well it has been consolidated. The slight slope suggested above ensures close contact to the sides on settling. The 14 foot base width enables the tractor wheels to cover all the area of the bottom of the silo. The depth should be from 4 to 8 feet, but well above the water table in the wettest period—such a site should be easy to find in Rhodesia. The length is in accordance with the amount of material to be ensiled. A rough guide for the estimation can be obtained as follows.

Estimated crop yield as hay x 3 = yield of settled silage, or, using Major Mundy's figures, a cubic yard of settled silage weighs about 750 lbs.

The soil from the trench should be placed on the edges of the sides, about six inches away, and built up to give the trench extra depth. This soil is later used to cover the ensiled material.

The sides should be made as smooth as possible, more elaborate silos are lined with brick or concrete.

The usual practice in Britain is to cut enough grass on a Saturday morning to fill the silo to about a depth of three feet. This is not heavily consolidated, and by Monday morning the correct temperature is obtained—tested by inserting the arm up to about the elbow into the material. If the heat is just bearable the temperature is correct; if it is still cold it is left a little longer to warm up; if it is too hot, it is subjected to heavy consolidation with the tractor which reduces the amount of air and checks the fermentation.

The grass is cut as young as it is possible to collect, the younger the grass the higher the protein of the resultant silage. Remember the ensiling process cannot increase the protein of the original material, it only reduces the loss. Just as much grass as can be handled quickly is cut and it is not permitted to wilt very much. Hay sweeps or a hay drag, as suggested by Major Mundy, are used to bring all the grass to the silo, or it can be loaded on to a low-loading trailer or wagon which can pass through the silo and help in consolidation. The grass must be scattered evenly in layers so as to avoid air pockets. The system of loading over a rope and pulling all the grass off at once is not advisable if it is done in the silo—better to offload at the side, unless it can be ensured that no air pockets are present. The material in the centre strip is kept about a foot above that at the sides. After the initial heating up the grass is fed into the trench and filling completed with continuous consolidation. Consolidation is very important, and where there is only one tractor on the farm, it is usually used to cut the grass, and in between cuttings to run up and down the trench slowly and gradually, moving from one side to the other, special care being taken to see that the consolidation is even over the whole area. During meal breaks and for an hour after the last filling each day the tractor is kept running up and down the trench. Thus a well compacted and almost air free condition is achieved. The initial heating up is sufficient to ensure the necessary fermentation takes place. The height above ground to which the trench is filled is only determined by the height the tractor can safely be driven over the grass heap. The material usually settles to about two-thirds its original height.

After consolidation the soil at the side of the trench is used to cover the whole surface to a depth of six to eight inches. Several successful silage makers in the United Kingdom find that coving soil is expensive, and prefer to put a few loads of inferior grass on top—consolidate it—and a two-inch layer of partly rotten material forms an airtight seal. This method is satisfactory even in the very high rainfall areas.

The need to add molasses or salt to the ensiled material is under debate in the United Kingdom, but in Rhodesia experience has shown that it is advisable to add molasses as the sugar content of the grass is low. Mr. de Klerk, at Mtao Forest Reserve, who has been making grass silage for a number of years, recommends three gallons of molasses made up to 44 gallons with water and sprinkled evenly on every load of 1,500 lbs. of green material. He has also used salt at the rate of 15 lbs. in 44 gallons of water for every load. The cattle, however, preferred the molasses silage, and appeared to do better on it than the salted silage. The A.I.V. method of making silage where mineral acids are used, is not recommended as the acid is extremely unpleasant to work with, and an acid neutraliser has to be added when feeding the silage.

When the silage is required, the lower end of the trench is opened and cross-sectional slices cut out with a well-sharpened axe, the material is usually too well consolidated for a hay knife. An advantage of the trench over the pit, as usually used for a silo in Rhodesia, is that the heavy silage has only to be handled at ground level, for a cart or wagon can be backed right up to the face of the silage for loading, and not thrown up several feet.

**The Clamp Method,** often termed the Stack Method in Britain, but the latter name is apt to make people think of the stack method used many years ago which was unsatisfactory, for even if the stack did not fall over there was always a considerable amount of wastage round the sides. The modern clamp method is similar to the trench method, except that the grass is ensiled above ground, and earthed over like a potato clamp. In Aberdeenshire, many farmers have built two concrete walls with parallel internal sides having a slight slope of one inch out for every ten inches of height of wall.

Napier Fodder, like maize, may not be so easy to ensile without the use of a cutter and blower. The Imperial College of Tropical Agriculture, Trinidad, issued a report entitled "The Preparation of Elephant Grass Silage and its Feeding Value for Tropical Dairy Cattle" in the January-June issue of Tropical Agriculture. Some of their information may have a very direct bearing on Rhodesian work. They used cylindrical pit silos and a cutter and blower, the grass was of about three months growth. "Daily fillings of 24,000 pounds were made with a total quantity of grass ensiled being 84,000 pounds. After each 3,000 pounds of chopped grass being blown into the silo, spread, and trampled, the surface was sprayed with 3 gallons of molasses. The molasses was diluted with water, the amount of which varied according to the dryness of the grass. The maximum dilution was two gallons of water to one gallon of molasses." After some five months the silo was opened, and a good quality silage was found—there was a little wastage on the outside which could possibly have been obviated had the sides been sloped. But it is always difficult in a cylindrical silo to get adequate consolidation at the edges; even trained horses used in Britain failed. The effective weight of the consolidating unit is the weight per square inch in contact with the surface, hence a wheeled tractor is normally better than a roller or a crawler tractor.

In Rhodesia, succulent winter feed is most valuable and ensilage made on the lines indicated above could fit in very well with pasture management, as much of the excess summer grass could be saved. But only too often, unfortunately, veld has such a sparse cover that very large areas will have to be cut for a comparatively small silo. Conditions of the veld vary considerably from farm to farm however, and farmers should consider well whether or not veld grass ensilage is worth making. Established pastures should give adequate amounts of grass for the purpose.

The secret of making good grass silage lies in using young grass, consolidating the material in the pit thoroughly, but above all, the determination to make good silage.

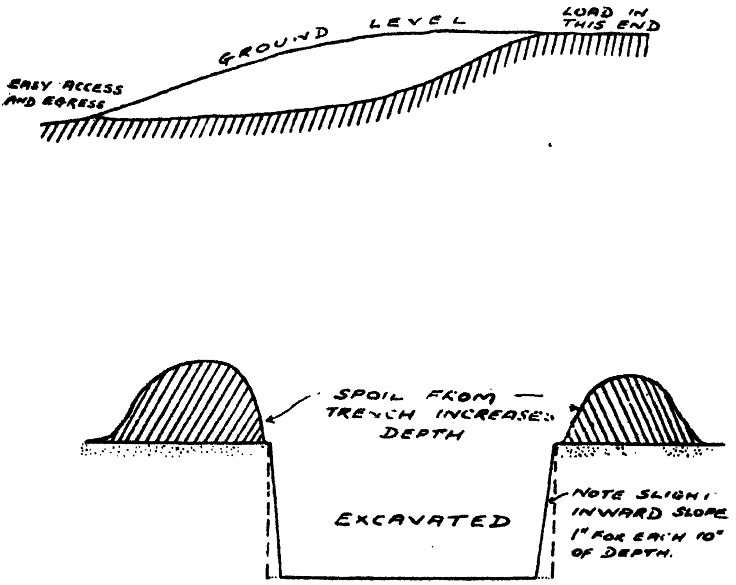
GROUND LEVEL
LOAD IN THIS END
EASY ACCESS AND EGRESS
SPOIL FROM TRENCH INCREASES DEPTH
EXCAVATED
NOTE SLIGHT INWARD SLOPE 1" FOR EACH 10" OF DEPTH.

Fig. I—Cross sections of a Trench Silo, suitable for grass silage

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Veld Grass Silage: *A Feature in Rhodesian Pasture Management*, by H. G. MUNDY, Dip.Agric.(Wye), F.L.S. Chief, Division of Plant Industry.

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# Onion Growing

## *(Allium Cepa Linn)*

By C. N. HAYTER, Horticulturist

To the farmer, market gardener, and home vegetable grower alike, the onion is a most important vegetable crop. Given correct and reasonably careful treatment, it is very profitable to grow, it is always in demand, and it ranks fifth in order of per capita consumption of kind of vegetable.

Being a crop which is not perishable when ripened and cured, it is favoured by those distant farmers and growers who, owing to lack of rapid means of transport, do not favour fresh vegetable production, except to supply the usually small local needs.

**Statistical.** Onion production and acreage figures for Southern Rhodesia for the past five years, kindly supplied by the Central African Statistical Office, Salisbury, are as follows:

| Year | Acreage | Total yield (bags) | Average yield per acre |
|---|---|---|---|
| 1944 | 629 | 33,874 | 53.8 |
| 1945 | 683 | 36,324 | 53.2 |
| 1946 | 579 | 33,327 | 57.6 |
| 1947 | 119 | 5,217 | 43.9 |
| 1948 | 239 | 12,327 | 51.6 |

Total average yield per acre over the five years = 52.04 bags. (N.B. Bags of 120 lbs. (pounds) nett weight).

While these average yields which have been taken from over the whole of the country are on the low side, some producers average approximately 100 bags per acre, and up to 200 bags per acre have been recorded, while, under very favourable conditions, 300 bags per acre can be obtained.

The following table shows production, imports, exports and apparent annual consumption over the past four years:

| | 1945 | 1946 | 1947 | 1948 |
|---|---|---|---|---|
| | 1,000 bags | 1,000 bags | 1,000 bags | 1,000 bags |
| Total production ...... | 36 | 33 | 5 | 12 |
| Imports ...... ...... ...... | 12 | 15 | 12 | 17 |
| Total supplies ...... | 48 | 48 | 17 | 29 |
| Exports ...... ...... ...... | 2 | 1 | 1 | — |
| Apparent consumption | 46 | 47 | 16 | 29 |

In 1946 even although the consumption for Southern Rhodesia was 46,000 bags, a shortage occurred in winter. Since then the population has increased considerably, and production has decreased partly owing to drought and water shortages, with the result that onion prices have soared higher.

Our shortfall for 1948 can thus be conservatively estimated to amount to 30,000 bags for our own consumption. There is also a small export trade which possibly could be extended and increased.

It will be seen therefore that there is little likelihood of there being any danger of overproduction by local growers for some time.

**Climate and Sowing Time.** The onion is essentially a cool weather crop, grown under our sub-tropical conditions. Seed sown during March gives the highest yields of dry onions and also ensures a dry harvesting season prior to the commencement of the rains.

From sowings I have made at fortnightly intervals from the end of February until the end of May, the yields were slightly progressively lower from each subsequent sowing. In addition most of the late crops had to be ripened under cover.

For pulling green, seed can be sown during January and February, but these early sowings promote bolters, double stems, split bulbs and thick necks, and such crops are of little use for storing.

**Soil Types and Requirements.** Onions are not particular about the kind of soil provided that it is at least moderately fertile, is well prepared, is drained, and can be supplied with water readily when necessary during the long dry spells. Where one can select the most suitable soil type, a sandy loam is ideal if the other essential factors are present. Red, chocolate or clay loams can also produce good crops, as also can vlei soils, if well broken up, and adequately manured and fertilised.

Occasionally, it is possible to obtain suitable vlei soils with high water tables which remain moist enough right through the dry season, without having to apply water artificially. Narrow sunken paths, three inches deep are sometimes necessary between beds to effect extra drainage.

The heavier, clayey soils require less fertiliser than the lighter loams in order to produce a good crop, but they are liable to cake unless plenty of organic matter is applied. Some difficulty may be experienced also at harvest time with late crops that dry out less readily after rain has fallen and the bulbs being then of softer texture, with thicker necks are not so suitable for storing.

Sand veld soils are mostly very hungry soils and require heavy applications of manure, plus plenty of fertiliser. More frequent irrigations will be necessary to avoid checks to the crops, which mature earlier in such soils.

**Rotation.** Although onions are one of the few crops which can be grown in the same position for several years following, with little drop in yield, it is not a wise practice to adopt.

It is sometimes done as such ground is clean cultivated and has less weeds, and fertility has been built up. Ultimate disaster may result, however, by causing soil deficiences, and also insect and disease attacks may increase rapidly.

**Manures and Fertilisers.** Applications of manure or compost at the rate of from 20 to 30 tons per acre (or ¼ to ½ inch layer) will produce good yields. This should be partly decomposed, so that it will break down readily, when turned into the soil and will help to promote a good tilth.

Superphosphate, 300 lbs. per acre, and muriate of potash, 100 lbs. per acre (or 1 oz. and ⅓ oz. per sq. yd. respectively) should also be applied with the manure. If a lesser quantity of manure or compost than 20 tons is to be applied, give 600/800 lbs. of mixed vegetable fertiliser per acre, instead of the superphosphate and potash.

Certain American information claims that some soils produce onions of poor colour with thin scales which fall off with handling, thus spoiling their appearance: such bulbs too are more liable to bruising. Experiments indicate that this poor colour is due to copper deficiency which can be improved by applications of 200-300 lbs. of powdered copper sulphate per acre. One application will last for several years.

**Need for Lime.** Onions dislike very acid soil. If the soil has an acidity greater than pH 5.6, apply a dressing of agricultural lime of one ton per acre (approximately ½ lb. per sq. yd.), after the soil has been manured and harrow or rake it in. A soil reaction of pH 6 to 6.5 is the usual recommendation. Wood ash can be used instead of lime at 1,500 to 3,000 lbs. per acre, but not for clayey soils.

**Soil Preparation.** The soil should be thoroughly prepared and a good tilth provided. Plough or dig it 8 to 10 inches deep, working in the manure or compost at the same time, followed by the dressing of fertiliser. Harrowing, discing or raking the land both ways will then be necessary, then level it off to facilitate irrigation later. Rolling or using sledge boards when it is in a fit state will be helpful where soils are loose and lumpy, as onions do better in fairly firm ground.

If it is feared that the soil contains too many weed seeds, and if time will permit, create suitable conditions for their germination in advance of seed sowing, or planting out. The resultant weed crop can then be speedily dealt with, saving much hand labour, than if it is left to germinate and grow with the onion crop.

**Onion Seed.** Onion seed rapidly loses its germination power after being stored for a year, unless kept at low dry temperatures; caution should therefore be taken when purchasing the seed, unless one is assured that it is new stock. Should there be any doubt, make a test seed bed sowing some weeks in advance of the sowing season, to avoid loss of time and waste of labour by using seed which may not be fertile.

**Sowing the Seed.** With seed of a high germination percentage, three lbs. are sufficient to provide enough plants for an acre, or ¼ ounce for a 100 ft. row of seedlings. An ounce contains approximately 7,000 seeds.

Dusting the seed at the time of sowing with an organic mercuric compound helps to prevent damping-off disease before the seedlings emerge.

Most onion seedlings are grown fairly close together in special seed beds and transplanted when large enough to their permanent positions. Although this entails much work later, the advantages are many as against sowing in situ where the plants are to remain undisturbed.

The advantages are:

(1) By sowing in beds, the seed is (a) concentrated in smaller areas, hence better texture and richer soil can be provided; (b) a better tilth is prepared; (c) the correct seed depth and soil covering being carried out more carefully gives better germination; (d) more economical use is made of seed;

and (e) there is a considerably less area of land to keep regularly watered, when dry.

(2) By sowing in beds, the seedlings can be kept free of weeds more readily.

(3) By sowing in beds a much more even stand of larger uniform sized onions is obtained, giving a heavier yield, as all weak and malformed plants can be discarded. The spacing is more correct and fewer blanks exist.

(4) By sowing in beds, less water is necessary to begin with owing to the smaller area in which the plants are concentrated and less manured ground is exposed to oxidisation.

The seed beds should be of good soil, reasonably firm and not wider than 4′ to avoid having to walk on them. A path 1′ wide will be necessary between beds to carry out the necessary cultural attention. Raising these beds 3″ above the soil level, will be a safeguard against the washing away of the seeds, should heavy rain occur, and will also provide extra drainage.

When the soil is dry enough to work freely, take out shallow flat drills, 6″ apart, and ½″ deep, and sow the seed thinly, allowing about 10 to 12 seeds per 1″ per row. The surface soil should be very friable so that the seedlings can push their way without difficulty.

Cover in carefully and lightly and firm the seed rows with the back of a rake. If the soil is inclined to cake on the surface, a sprinkling of dry sand or old sifted compost which is known to be free of weed seeds can be drifted over the rows. In dry weather, a thin covering of grass is very helpful in assisting germination as it keeps the soil cool and retains moisture. If placed in the same direction as the rows of seeds, the grass can be left in position on top of the soil and the plants will push their way up through it.

To get good germination, watering must be attended to regularly whenever the soil becomes dry. Use a watering can or hose pipe with a rose attached.

When the seedlings first appear above ground the first seed leaf of each is in the shape of a hair pin, the point of the leaf remaining buried and absorbing food from the seed. Ultimately, the tip straightens out, carrying the seed coat with it. The firming of the soil after sowing ensures the seed being firmly embedded, and it is not liable to get pulled out by the tension set up by the seed leaf when straightening out.

Remove all weeds before they overcrowd the seedlings. Keep the plants growing steadily by giving regular waterings when necessary in order to avoid a check.

**Sowing in Situ.** If sowing direct is adopted, cut down the amount of seed to 2 lbs. per acre. This should give a good stand, and no thinning out should be required. Where blanks occur some transplanting will be necessary.

**Transplanting.** When the plants are 6-7" high and slightly thinner than a pencil, usually about 8 to 10 weeks from seed sowing, they are ready for transplanting. The sooner they are put out at this stage, the greater will be the yield, as vigorous growth can be maintained. If transplanting is done when the plants are smaller, more losses occur. If plants are allowed to stand too long in the seed beds, they begin to form bulbs prematurely and transplanting at this stage only gives a very low yield.

The evening before transplanting is to be done, give those seedlings which will be required each day a good watering so that they can be lifted easily, and they will be able to stand the disturbance better. Do not pull the plants out of the soil, but lift them with a fork inserted down the side of the row to avoid root injury. Discard all plants which are malformed, weak and small, as such plants reduce the yield.

**Trimming the Plants.** Cutting off the tips of the leaves and shortening back the roots prior to transplanting are. operations which are very debatable as to their necessity. American experiments covering a period of five years showed a slightly higher yield from untrimmed plants than from those severely pruned. Those severely pruned were set back two weeks. Apart from being easier to handle and transplant, there appears to be no other reason for the treatment. Much depends on the system of planting adopted.

**Planting Systems.** No matter what system of planting is advocated, care must be taken that they are not planted too deep. A ¼" deeper than the plants stood in the soil in the seed beds is correct. Poor yields can often be traced back to too deep planting. Plant in moist soil.

The rows can be 10", 12", 15" or 18" apart, according to whether hand or mechanised cultivation is being used, and the plants spaced 3" or 4" apart in the row. Too wide spacing delays ripening, and gives fewer, but larger bulbs, which grow too large for average household use.

The best results of all are obtained by planting with a trowel. Depth can be controlled readily, firming can be well done, and the plants become established in a shorter time, because the roots need not be cut away, and can be spread out fan-like in the holes. Once one gets used to such planting, it can be done quickly with the minimum of movement. Dibber planting is often done with much success. On one farm a four row frame dibber was well used.

Another method of planting consists in taking out shallow furrows with hoes, spades or ploughs. Plants are then laid against the far side of the furrow in a slanting position. Later the furrows are partially filled in, firmed and watered.

For large scale growing under flood irrigation, the ground is divided into lands, each with a low embankment between to facilitate irrigating. The width of the land depends on the fall of the ground, but should be such as to allow for 4 to 10 rows. The day prior to planting out, the estimated number of lands that can be planted are given a shallow surface irrigating so as to penetrate 3" deep. The next day rows are suitably marked out and spaced according to the method of cultivation to be used. The planting system adopted by one large grower is as follows: The plants are lifted, the roots cut back to within about a ¼" of the base of the bulb, and the leaves cut back to half their length. Transplanting then consists of merely pushing the small plants in the moist soil without using dibbers. With such severe pruning, the plants have to make a completely new root system from the basal plate of the small bulb, and this puts them back for several weeks.

This method took four workers 7 days to plant out an acre of plants which were spaced at approximately 5" apart, with rows spaced 15" from each other.

So far transplanting machines have not been used here for onions owing to small scale growing, and the fact that hand labour, although not always plentiful, is cheap.

**Green Onions.** Early sowings are made in January and February to produce green bunch onions for sale in Winter and Spring, after the dried crop comes to an end. They are usually pulled direct from where they have been sown as soon as they reach an edible size. As the larger ones are removed, the remainder get the extra space to develop.

**Mulching.** Where mulching can be carried out it is of considerable benefit to the crop and saves much water. Experiments show that evaporation is reduced by 42 per cent., but slightly heavier applications of nitrogenous manures or fertilisers are necessary to compensate for that used by the mulching materials. A mulch also increases the yield and promotes larger bulbs.

If hand cultivation is used it is advisable to place long grass between the rows as planting proceeds, or short materials such as groundnut shells, sawdust, short shavings from planing machines, compost, etc., may be used.

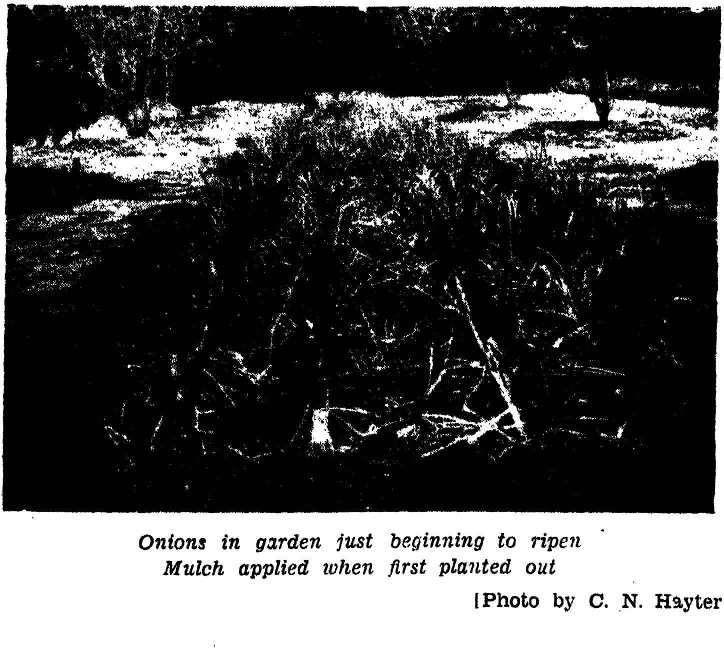
**After Care and Cultivation.** All cultivation to control weeds must be shallow, as the small feeder roots are near the surface. Care should be taken not to hoe too close to harm the bulbs. Hand weeding will be necessary between the plants, which is the most laborious and expensive operation in onion growing.

Much time may be saved by using oils such as the denitro types, or dilute sulphuric acid for killing thick weed growth in the early stages. These must be handled by a capable person to avoid mistakes, and damage to the plants. Onions are sensitive to some weed-killers, and may be severely injured or even killed by even light applications of the selective hormones.

It is essential to remove weeds before they mat around the plants as at such a stage, they not only check early growth, but make the cleaning extremely slow and expensive. When pulling out the weeds the onions are also loosened, and their growth further retarded.

*Plants in Seed Bed ready for transplanting*

[Photo by C. N. Hayter



*Onions in garden just beginning to ripen*
*Mulch applied when first planted out*

[Photo by C. N. Hayter

*Onions (Field Scale) soon after transplanting*

[Photo by C. N. Hayter

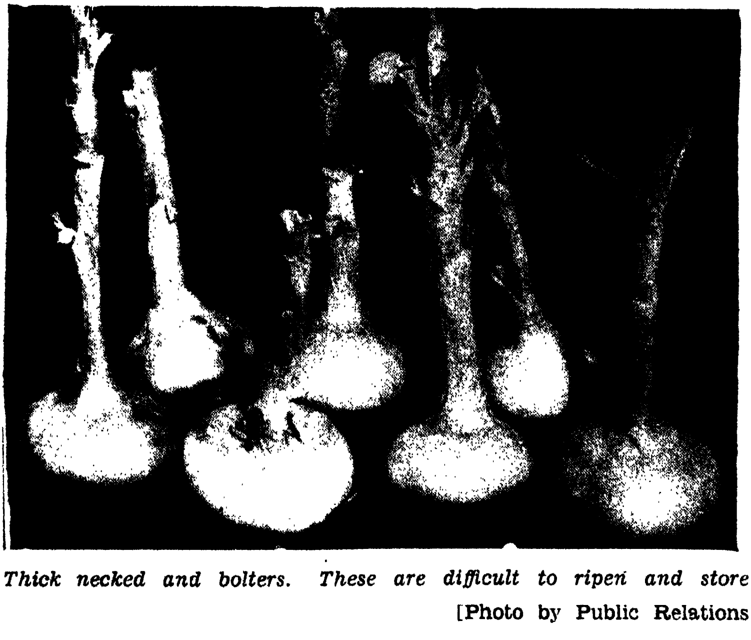
*As above 4½ months later*

*Field grown Onions. Tops falling over naturally as ripening commences*

[Photo by C. N. Hayter

*A few bolters in foreground*

[Photo by C. N. Hayter



*Thick necked and bolters. These are difficult to ripen and store*

[Photo by Public Relations

*Early Cape Flat Onions well ripened and cured for storage*
*Note thin necks*

[Photo by Public Relations

*Onion Varieties*

*Early Cape Flat*

*Australian Brown* *Yellow (Straw) Globe*

[Photo by C. N. Hayter

**Supplementary Feeding.** Fairly vigorous growth must be maintained with onions. If the plants do not get away quickly a stimulant can be given.

It has been proved that an application of sulphate of ammonia within the first 4 or 6 weeks after transplanting, can increase the yield by amounts up to 50 per cent, by promoting larger bulbs. Apply 150 lbs. per acre, or one ounce per 9′ of row alongside the plants, and lightly water in, taking care not to wash out by an excessive quantity. Diluted liquid manure can be used instead.

Little benefit is gained by such feeding if carried out more than six weeks after transplanting.

**Irrigation.** It is only possible to grow onions in this country without irrigation in vlei lands with a high water table. Owing to their small amount of leaf area, as compared with the cabbage family and other leafy crops and also, being cylindrical they transpire less. Their water requirements are smaller than most crops, but must be applied regularly to get good yields.

Once the onions have become established and are making quick growth, avoid excessive irrigations which cause the plants to grow coarse, and cause the leaves to become bloated and rank. Such growth, if continued, will cause the plants to produce thick necks, with poor development of bulbs later, which are difficult to ripen.

Should this condition commence, ease up with the irrigating, and withhold the water for a longer period and apply only half the quantity.

The frequency with which it will be necessary to irrigate will depend entirely on the type of soil and weather conditions, but but sandy loam soil will probably require water every 7 days. The adage " never irrigate a wet soil " is most applicable to onion growing; generally speaking the water requirements are light in the early stages, gradually increasing as the crop becomes half grown.

Should the plants be stinted, however, and insufficient water applied in the early stages, the growth becomes arrested and application of heavy water later will not alter such a condition. Many of the split bulbs, double stems and bolters, with consequent low yields can often be traced back to the plants having received such a check. Break out any flower stems growing close to the leaves, as soon as they are noticed.

When the plants begin to ripen, irrigating or watering should be discontinued to allow the soil to dry out and to facilitate bulbs to ripen under dry conditions so that they have a better keeping quality.

**Harvesting and Curing.** From 4-5 months after planting out, the bulbs cease to grow, and the stems begin to fall over at the neck, an inch or so above the top of the bulb, and the tips of the leaves turn yellow. While some growers lift their crops at this stage, a heavier yield is obtained if harvesting is delayed until the majority have fallen over. When this stage is reached, those stems still remaining erect should be bent over by treading or rolling. If a roller is used it should be heavy enough to press the tops over, but light enough not to injure the bulbs.

There is no need to delay lifting until the leaves are all dry. If harvested slightly immature, the bulbs retain their outer scales better, and result in less store losses. Avoid pulling off their necks when lifting as this damages the tops of the bulbs. Shake off the soil.

Place the bulbs on their sides in wind rows to dry off so that each row of bulbs is covered by the tops of the succeeding row to shade them from strong sunlight, and to avoid sun scald. Each last row of exposed bulbs in each series of wind rows will need a light covering of grass for shading. Should the weather be extra hot it is safer to stand the bulbs upright as they are lifted in order to dry off, or carry them away and place them in the shade beneath high branched trees where hot winds may blow over them until they become well cured.

When all the tops are completely dry, and show no green portions, the bulbs may be marketed or stored. If they are being marketed right away trim off the tops to leave a short stem and cut off the roots, but not too closely. For storing purposes leave the tops intact to assist air circulation. If the tops are cut this causes some bulbs to produce new top growth.

All thick necked onions and bolters should be kept separate and used immediately as they do not keep well and they spoil good samples.

**Storage.** The idea of storage is to hold the crop and dispose of it when the seasonal rise in price takes place, usually about **January** onwards, or to use it for one's own consumption later when the unstored crops are cleared off the markets.

For successful storage it is essential to use cool, dry, airy buildings with diffused light, and with plenty of ventilation. If the atmosphere is too damp and warm, the onions will not keep firm and sound, but will become soft and commence to grow.

Place the bulbs on slatted or wire netting racks, shelves or crates with slats between to allow air spaces. They should be arranged in tiers and the onions spread out two or three layers thick. Go over them occasionally to remove any decayed bulbs and any commencing to sprout. Another way is to tie the onions into bunches and suspend them under cover. Thoroughly dry bulbs can be stored temporarily in open mesh sacks in well ventilated places.

**Grading and Marketing.** Much of the trouble with the production of dry onions in this country is that the crop it often irrigated right up to the time of lifting instead of being dried off. This is followed by cutting off the tops immediately the batches are lifted, and bagging the bulbs immediately, and marketing them in this wet and green condition. Thus little or no attempt is made to dry, cure, and grade the onions.

Such faulty methods cause artificial gluts to occur soon after the bulk of crops are lifted, and markets are flooded with onions which will not keep. Most of these consignments have to be spread out to dry after marketing to avoid severe losses due to wet rot.

Once these are cleared, and the correctly dried crop takes their place, prices then rise and continue to do so at intervals as the season extends. Thus with proper care, and where the the grower has good storage facilities, there is an opportunity to realise the higher prices.

Onions always fetch better prices if carefully and honestly graded into uniform sizes. It is suggested that four size grades be used, namely:

(1) LARGE, not more than six, by weight, to the lb.

(2) MEDIUM, not more than 12, by weight, to the lb.

(3) SMALL, not more than 22, by weight, to the lb.

(4) PICKLING, exceeding 22, by weight, to the lb.

Do not overpeel bulbs when preparing for market, merely remove discoloured scales.

**Varieties.** Though onion varieties are legion, we have few which give high yields that are really suited to our conditions.

**Early Cape Flat.** Early variety and a strain of Yellow Bermuda are the most satisfactory varieties. These bulb well under short day conditions, and constitute the bulk of all the onions grown in Southern Rhodesia. If well cured and carefully handled, they will keep well into May.

**Australian Brown.** Main crop does quite well in the cooler areas, but only yields about two-thirds the crop produced from the Early Cape Flat variety, and takes at least two months longer to mature. It is globe-shaped, and an excellent keeping variety for late marketing.

**Cape Yellow (Straw) Globe.** This is also a main crop variety which resembles Australian Brown in its ripening and yielding. While being a good keeper, its lower yield and long season of growth makes the growing of such varieties more expensive, and for which no higher prices are obtainable.

**Copper King.** This is a dark purple, round, main crop variety, which does not bulb as readily as the former mentioned varieties. When the white fleshed varieties are readily obtainable, it is only possible to dispose of Copper King bulbs at lower prices.

**Silver King; Crystal White Wax; White Portugal Silverskin.** All these are quick maturing varieties, with white flesh, very suitable for growing as spring onions, pulling green, or for pickling, if grown very close together. They are not recommended to grow as dried onions, as the skins being thin and the flesh soft, they will not store.

**Early Grano (Babosa).** This variety is adapted to the same conditions as for the Early Cape Flat, and it matures at the same time. Its advantages however consist in being much less prone to bolting (running to seed prematurely) and in being a heavier yielder. An improved selection "Texas Grano" has since been made which ripens earlier and more uniformly.

From experiments carried out by the Division of Horticulture, Pretoria, this selected Texas Grano variety has been very successful. As it is round to top-shaped, closer spacing in the row is possible, thus giving a much heavier yield. The bulbs also weigh more than those of Early Cape Flat Variety of the same diameter.

Though the variety has not, to my knowledge, been tried in this country, it would appear to be very suitable for our conditions.

**Seed Production.** Very few Southern Rhodesian growers worry to produce their own seed. For the large grower, this is understandable, but for the small grower, selections can be carried out and planted in order to obtain his own requirements. Seed can thus be provided of a known high standard, which is also better adapted to the specific local requirements.

The bulbs should be specially selected in the field prior to harvesting, so that they conform to correct time of harvest, and trueness to type. They should have a small neck, be well shaped, and free from disease.

Harvest such bulbs separately, handling them carefully to avoid bruising, and store under best conditions. They should be inspected at intervals to remove rotted or sprouted bulbs.

Plant out the bulbs in May or June, 3" deep, 9" apart, and in rows 2' apart in fairly fertile soil. Little water is required until growth commences. Once the bulbs are well established they split up, and each portion produces a tall flower stem.

Where strong winds are experienced, provision must be made to support the seed heads by tying them to stakes.

As the seed heads turn yellow, usually about 4½ months from planting, and the seed capsules commence to burst, showing black seeds, harvesting should begin. As this stage of maturity is reached the individual heads are cut with a foot of stalk. Spread them out on sheets, but do not dry off too rapidly as this may affect germination later.

When thoroughly ripe, place the seed heads loosely in a sack, and beat out with a stick, or rub them out on a coarse sieve. Trash and light seeds can be removed by throwing into a shallow vessel of water when the heavier, best seed settles to the bottom. Remove at once and spread out to dry thoroughly before storing.

On no account should seed be saved from bolters which run to seed the first season, or the trouble will be perpetuated.

**Pickling Onions.** The white, silver-skinned varieties generally used for pickling, should be grown hard. Choose sandy, less fertile soil which should be unmanured, following a crop so treated.

Sow seed broadcast in March-May, or August-October, at the rate of an ounce to 10 s. yds. of seed bed, to encourage crowding and restricted size.

Apply water regularly to obtain good germination, and then sufficient only to make dwarf growth. When the bulbs are the required size, no further water is given and ripening off occurs. Lift, dry and store.

**Pests and Diseases.** Very few pests and diseases attack onions. Thrip insects sometimes attack a crop and cause the leaves to become very silvery and thus reduce the yields. If serious, wettable D.D.T. sprays or dusts can be used to combat them.

Cutworm damage can be troublesome in the seed beds, or soon after transplanting, but can usually be controlled by hand. White ants (termites) have been known to eat the tops and scales of bulbs, when ripening begins. If this occurs lift plants and remove them from the area.

Detailed information on the pests and diseases of onions along with the treatment for same can be obtained from the Division of Entomology, and the Division of Botany and Plant Pathology, Department of Agriculture, Salisbury.

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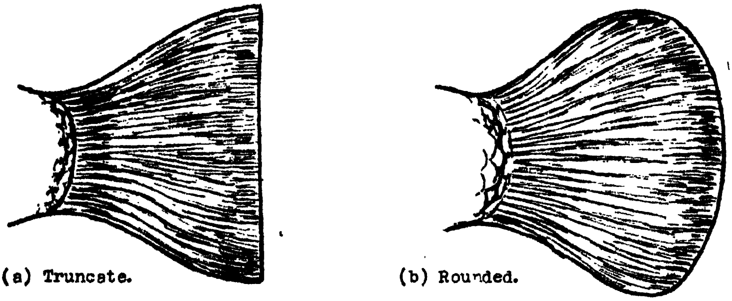
# Some Notes on Freshwater Fishes in Southern Rhodesia

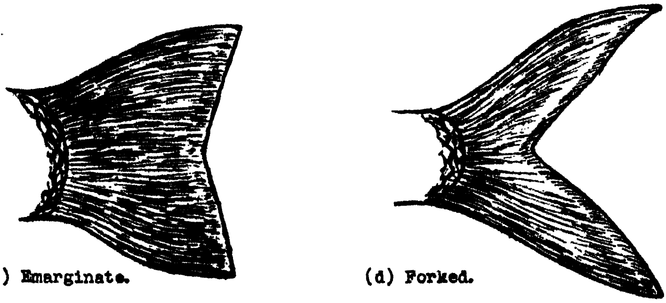
## PART II

By R. A. JUBB, B.Sc.

On examining a tiger fish and a bream it will be seen that, in addition to other marked differences in shape and outward appearance, the tails or caudal fins are different. In the study of our freshwater fishes we need recognise four characteristic tail shapes—they may be truncate, rounded, emarginate or forked; these are shown in Fig. I, (a), (b), (c) and (d).



(a) Truncate. (b) Rounded.



(c) Emarginate. (d) Forked.

Fig. I.

Gilchrist and Thompson describe the tail of *Tilapia melanopleura* (Bream) as "caudal truncate or feebly emarginate," the tail of *Hydrocyon lineatus* (Tiger fish) as "caudal deeply forked, with long pointed lobes and the tail of *Haplochromis moffati* (small bream) as "caudal rounded." The common "barbel" has a rounded tail, yellow fish and silver fish have "forked tails."

The nostrils of a fish are sensory organs. Respiration is carried out by means of the gills. Lift the operculum or gill cover and you will find the gills, usually four in number. Look into the mouth and you will see the arrangement of the gill arches. If you are still interested, carefully remove the gill nearest the snout, i.e., the "anterior arch," and if the fish happens to be *Tilapia mossambica* you will have an organ resembling Fig. II. The gill arch is cartilaginous; the side facing the mouth carries gill-rakers, the side towards the tail vascular gill filaments, i.e., full of blood vessels. These gill filaments are red and the water taken into the mouth passes over the gill filaments where the oxygen dissolved in the water is absorbed by the blood through the thin membranes; the water is then ejected past the operculum or gill cover. Gill filaments are not important for identification of fish but gill rakers are.

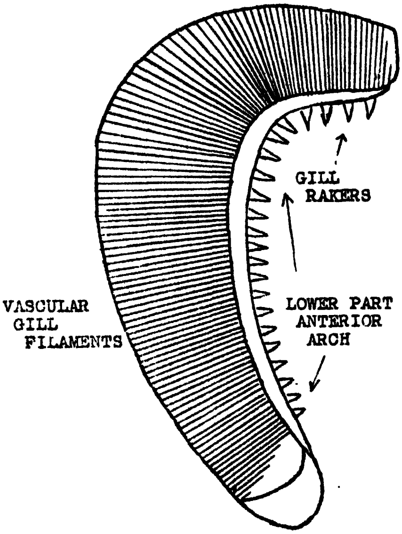


FIG. II.

Gill-rakers, comb-like structures that strain the water and prevent food from escaping and, incidentally prevent unwanted foreign matter from reaching the gill filaments, vary in shape and number. From an examination of their shape experts are able to state the feedings habits of a fish. The number of gill-rakers does not vary widely in any one species and is of use in diagnosis, the number of rakers on the lower limb of the outer or anterior arch being taken. In the example shown in Fig. II the number of gill-rakers on the lower part of anterior arch is 18.

The Family *CYPRINIDAE* (sometimes called the Carp Family) is represented in Rhodesian waters by two important genera:

1. *Labeo.* This genus includes species described as having mouth inferior with much developed lips. The term "inferior"

is used when the mouth is below the snout. Species of this genus are not often caught, but what few there are, are locally known as mudsuckers.

2. *Barbus.* This genus includes yellow-fish, silver fish and minnows. The common species have either one or two pairs of whiskers on each side of the mouth, these are called barbels. (Fig. III.)

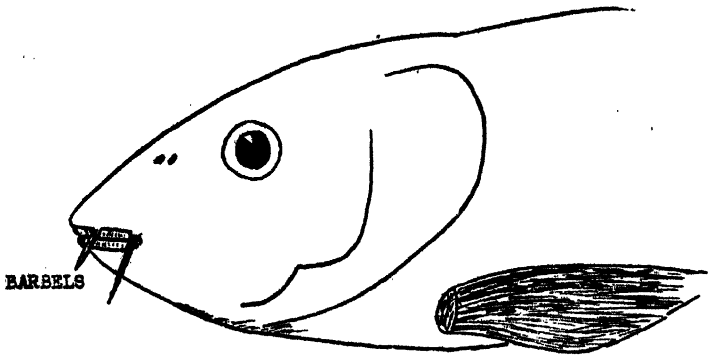


FIG. III.

Barbels are described by Mac Mahon as " delicate organs of touch associated with bottom feeders." He suggests that barbels may even reveal the presence of food. There is every reason to accept these statements as, in Rhodesian waters, most fish with barbels are caught either in cloudy or deep water.

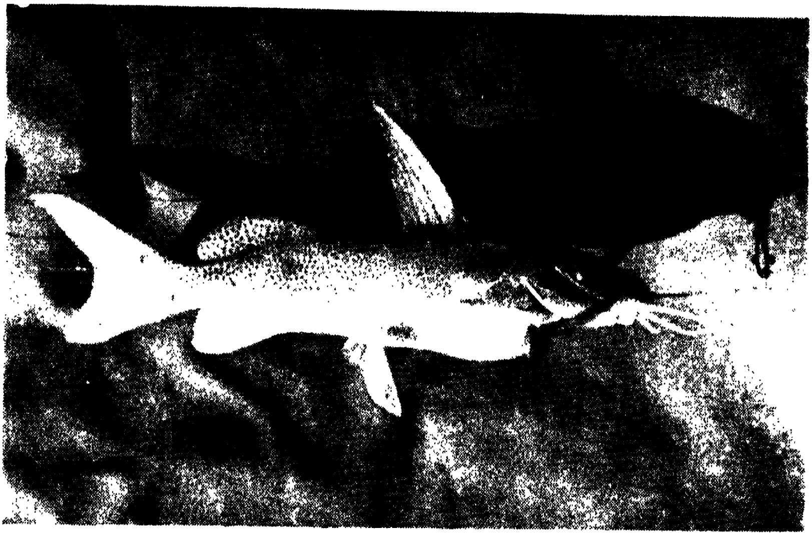
Species of the genus *Barbus* are caught in rivers in England —Marshall-Hardy in "Angling Ways " refers to " the sporting Barbel (*Barbus barbus, Barbus vulgaris*)," H. D. Turing in " Modern Coarse Fishing " says " Barbel (*Barbus fluviatilis*) are among the most esteemed of anglers' fishes." It is strange, therefore, how the name barbel has been applied to catfish in Rhodesian waters. These do not resemble species of the Barbus group at all.

If a local angler mentions a barbel you can be sure he is discussing a member of the Family *SILURIDAE.* In North America you would call it cat-fish. The chief characteristics of the Family are the presence of numerous single or branched barbels from the upper and lower jaws, and, there are no scales.

A brief summary of the important genera of this Family follows:

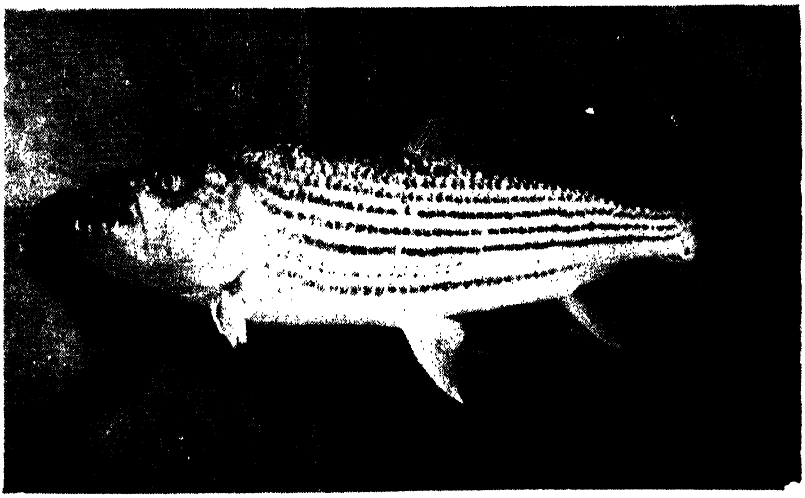
1. Genus *Clarias*—Common barbel.
2. Genus *Heterobranchus*—Vundu.
3. Genus *Synodontis*—Squeakers.

Species of the genus *Synodontis*, known as squeakers because of the peculiar noise they make when removed from the water, are more common in the Zambesi River itself. If hooked, the



Squeaker (*Synodontis melanostictus*)

[Photo by R. A. Bourlay



Tiger Fish (*Hydrocyon lineatus*)

[Photo by R. A. Bourlay

greatest of care must be exercised in removing them as all species have a pronounced spine in the dorsal fin as well as in each of the pectoral fins. These spines are sharp and when alarmed, the fish extends them rigidly and makes itself particularly unwelcome around bare feet or in a boat. In size the species rarely exceed about 12 inches, but remember the spines can inflict a painful wound, often followed by blood poisoning.

Illustrated is a specimen of this genus, *Synodontis melanostictus*. Note the pronounced spine in the dorsal fin and the large adipose dorsal fin. The tail would be described as deeply forked, upper lobe longer than the lower one.

The second illustration is of a Tiger fish (*Hydrocyon lineatus*). Again external characteristic features can be noted. The mouth would be described as terminal with prominent teeth. There are two dorsal fins, the second one adipose. The tail, caudal fin, deeply forked with prominent lobes. Length of fish a little more than five times the depth. What the illustration cannot show is that, fresh from the water, the fish is silvery white with jet black longitudinal stripes and the dorsal and caudal fins edged with bright orange-red, a magnificent fish in shape and colour and a real tiger when hooked.

It takes some experience and training to identify individual species, but, with practice, it is possible from an examination of the external features of a freshwater fish to recognise a Family and Genus. Once the Genus is established the search is considerably restricted. With the aid of a book of reference and the local name it is usually possible to track down the species or very near to it.

The following key, which has been prepared from external features only, may be of some use as an introduction to the more detailed study, of our freshwater fish fauna.

**Freshwater Fishes** whose length is greater than three times the depth, in general these fish are obviously long.

**Section I.** Tails deeply forked. Distance between lobes of tail equal to or greater than depth of fish.

A. Dorsal fin two spines. Small adipose dorsal fin.

Family *CHARACINIDAE.*

i *Sarcodaces odoe*—Pike.
ii *Hydrocyon lineatus*—D II 8-9; A III 10-13; Tiger fish.
*Hydrocyon vittatus*—D II 8; A III 14; Tiger fish.
iii *Alestes imberi*—Chesa.
iv *Alestes lateralis*—Minnow.
v *Micralestes acutidens.*
vi *Distichodus mossambicus.*

B. Dorsal fin 2-4 spines. No adipose dorsal fin.

Family *CYPRINIDAE.*

The genera are:

i *Labeo*: Mouth inferior with prominent lips. Lateral line equidistant between back and belly. Mudsuckers.

Mudfish.

ii *Barbus*: Most species with pair of barbels on each side of the mouth. Lateral line nearer belly than back.

Yellow-fish. Silver-fish.

iii *Barilius*: Dorsal two spines. Dark vertical bands on each side of body.

Banded Minnow.

iv *Varicorhinus*: In appearance intermediate between genus *Labeo* and genus *Barbus*, but lower jaw with sharp cutting edge covered with horny sheath.

Not common.

C. Dorsal with one pronounced spine, sharp, and often serrated.

Large adipose dorsal fin. Three pairs of long barbels, those on lower jaw usually branched.

Family *SILURIDAE.*

Genus *Synodontis.*

Squeakers.

**Section II.** Tail forked. Distance between tips of lobes of tail equal to or less than depth of fish. Tail obviously small for size of fish. Scales small.

Family *MORMYRIDAE.*

A. Fish with pronounced snout.

i Genus *Mormyrops*. *Mormyrops deliciosus*—Cornish Jack.

ii Genus *Mormyrus.*

*Mormyrus anchietae.* Bottle nose.

*Mormyrus longirostris.* Bottle nose.

B. Fish without prominent snout. Head rounded.

i *Genus Marcusenius.*

C. Fish without prominent snout, but with prominent chin.

i *Genus Gnathonemus.*

**Section III.** Tails rounded. No scales.

Family *SILURIDAE.*

A. Dorsal fin long with no spines. Four pairs of prominent barbels unbranched.

i Genus *Clarius.*

*Clarius gariepinus.* Barbel. Catfish.

*Clarius mossambicus.* Barger. Barbel.

B. Two dorsal fins. The posterior dorsal fin adipose and as long as anterior dorsal fin which has no spines, just rays.

Four pairs long barbels, unbranched.

i Genus *Heterobranchus.*

*Heterobranchus longifilis.* Vundu.

**Section IV.** Tails rounded. No ventral fins. Scales small.

A. Dorsal fin very long and joined to tail, no spines on dorsal surface.

Family *ANGUILLIDAE.*

Genus *Anguilla.*

i *Anguilla mossambica.* Freshwater Eels.

ii *Anguilla bengalensis.* Freshwater Eels.

B. Dorsal very long and with many spines.

Family *MASTACEMBELIDAE.*

Genus *Mastacembelus.*

*Mastacembelus mellandi.*

**Section V.** Tails rounded. Lateral line in two sections. Scales large. Dorsal fin with spines and rays.

Family *ANABANTIDAE.*

i Genus *Anabas.*

*Anabas rhodesianus.*

*Anabas multispinis.*

**Freshwater Fishes** whose length is two or three times their depth. Lateral line in two sections. A single nostril on each side of head. Dorsal fin about half the length of the fish, consisting of spines and rays. Appearance deep.

**Section I.** Family *CICHLIDAE.*

Commonly known as bream.

A. Tail rounded. Large mouth. Predator.

Genus *Serranochromis.*

i *Serranochromis augusticeps.* Marbled Bream.

ii *Serranochromis thumbergii.* Olive or Yellow Bream.

iii *Serranochromis macrocephalus.*

B. Tails truncate or slightly emarginate. Mouths medium to small.

Genus *Tilapia.*

There are some nine species of this genus, the more common being:

i *Tilapia melanopleura.* Olive Bream. Small mouth.

ii *Tilapia mossambica.* Bream, Kurper. Large mouth.

iii *Tilapia kafuensis.* Kafue Bream.

iv *Tilapia macrochir.*

v *Tilapia sparrmanii.* Small Bream.

Of the non-indigenous fish we have Family *CENTRARCHIDAE.* Length three to four times depth. Dorsal fin notched, anterior portion spinous, posterior with rays. One lateral line unbroken.

A. Genus *Micropterus.*

i *Micropterus salmoides.* Large mouth Black Bass. Mouth large extending beyond eye. Ten rows of scales on cheek.

Sometimes known as *Huro salmoides.*

ii *Micropterus dolomieu.* Small mouth Black Bass. Mouth small, not extending beyond eye. Seventeen rows scales on cheek.

iii *Micropterus punctulatus.* Spotted Bass. Mouth small. Cheek scales 12-14, usually conspicuous spot on base of tail.

B. Genus *Lepomis.*

i *Lepomis macrochirus.* Blue gill. Sunfish. Length two to two-and-a-half times depth. Can be mistaken for a bream, but distinguished by the single lateral line and pronounced dark flap on gill cover.

Family *SALMONIDAE.* Length five times depth. Tails slightly emarginate. No spines in Dorsal fin, and small adipose dorsal fin.

i *Salmo fario.* Brown trout.

ii *Salmo irideus.* Rainbow trout.

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Photographs by R. A. Bourlay.

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ERRATA—November-December, 1949, R.A.J.—

In the article entitled "Some Notes on Freshwater Fishes in Southern Rhodesia," p. 466 "*Tilapia melanpleura*" should read "*Tilapia melanopleura.*"

Illustration of *Serranochromis thumbergii,* more commonly known as Yellow Bream.

# A Guide to Some Rhodesian Soils

## II. A Note on Mopani Soils

*(With particular reference to the Sabi Valley, Southern Rhodesia)*

By B. S. Ellis, B.Sc., D.I.C., F.R.I.C.
Office of the Chief Chemist, Dept. of Agriculture, S. Rhodesia.

(The greater part of this paper was read at the African Conference on Soils, Goma, Belgian Congo, and was published first in the " Bulletin Agricole Du Congo Belge," Vol. XL, Fasc 1.)

**Introduction.** Mopani soils are those soils which are associated with the tree *Copaifera Mopane*, and, although they vary in detail, there is a broad similarity between them which distinguishes them from other soils and justifies their consideration as a soil group. *Copaifera Mopane* occurs extensively in Central Africa and is found in Southern Rhodesia, Northern Rhodesia, Angola, Portuguese East Africa, the Bechuanaland Protectorate and the Northern Transvaal, and the southern corner of Nyasaland. In Southern Rhodesia the tree is dominant in the lower-lying, hotter areas. Henkel (1) says:

" The middle veld merges imperceptibly into the low veld where the mopane (*Copaifera Mopane*) is the dominant tree. Mopane occurs in nearly pure forest over extensive areas, only interrupted in places by low hills and ridges where it occurs mixed with other trees. It is a true savannah tree, but unlike the *Brachystegias*, is capable of living in low-lying land, alternately wet and dry. In the low veld it occupies places which, in similar situations on the high veld, carry grass. The understory of grass in such places is unusually thin and poorly developed. The tree has a fire-resistant bark and its buds are protected by thick stipules. In dry situations flushing into foliage does not take place until rains have fallen. In better watered south-eastern low veld it extends northward only to the foothills and westward up the Limpopo valley to the watershed at Plumtree where it is found associated with *Proteas*.

" In the low veld of the Zambesi Valley, mopane also covers extensive areas, but on the drier western slopes of the main divide, it is frequently found on the high veld almost to the main watershed.

" Mopane is an aggressive tree and tends to oust competitors. Its associates are chiefly found in better drained areas. A characteristic associate is the Baobab—(*Adansonia digitata*). On the higher parts of the low veld it is frequently found mixed with *Brachystegia Woodiana.*"

In his Provisional Map of Vegetation Types of Southern Rhodesia, of 1930, Henkel shows *Copaifera Mopane* as the dominant type around practically the whole perimeter of the Colony, with long tongues from the peripheral mass licking up the valleys of the larger rivers to the watershed. This picture is exaggerated, but the tree does occur very extensively, and because it is always associated with soils having certain characteristics in common, the whole question merits careful investigation.

As far as is known no previous study has been made of mopani soils although they are regarded in the public mind as having distinctive properties. They are known to be generally heavier and more clayey than adjoining soils, therefore harder to work, and are usually thought of as comparatively infertile.

**History of Investigation.** The investigation was commenced some twelve years ago at Umgusa, near Bulawayo. (Information regarding this area, and other areas mentioned later, is given in Table 1.) The soils for the most part, where no mopani occurred, were pinkish or reddish sands and light sandy loams, largely alluvial, and derived from basalt, sandstone, and some granite. Where mopani did occur the soil bore every outward appearance of infertility. Under the mopani trees, the grass, which elsewhere in the area was thick and luxuriant, faded away and vanished. The surface was scored with numerous erosion channels and gullies, with here and there a hard, caked depression. The soil profile showed from 2 to 3 inches of sand, of a pH of 6.2, crusted with flakes of silt and clay, overlying a yellowish, undifferentiated layer with a pH of 8.3, which persisted unchanged, except for increasing compaction, to the depth of the pit, that is, 6 feet. The soluble salt content of the mopani soils averaged 0.225% for the lower layers, whereas that of corresponding normal soil was in the region of 0.04%. Of the 0.225%, 0.04% was sodium and 0.002% potassium. The mopani soils contained up to 0.45% free $CaCO_3$, and of a total exchangeable base content of 15 mg. equivalents per cent., exchangeable sodium accounted for 8 mg. eq. %. In the adjoining normal soils the exchangeable sodium content was neglible. De Sigmond (2) has laid it down that when the sodium equivalents in the exchange complex exceed 10-15% the dispersing effect of the sodium cations becomes appreciable. It was therefore assumed that the compaction, the impermeability and the infertility (as indicated by the complete lack of grass) were due to the presence of exchangeable sodium.

It seemed likely, when the sodium became water-soluble and was washed out on to lower-lying ground, that this in turn would become contaminated. This was in fact found to be the case, and it was significant that the natives in that area had dug a drainage furrow down the slope, below the mopani, so that water washing off the mopani soils should discharge into a vlei, and not wash on to their productive lands.

Mopani soils were next encountered at the opposite side of the country in the Maranka Reserve, near the Eastern Border.

It was noted here that mopani trees began to appear, and quite thickly, on soils derived from the Umkondo Series, that is quartzites, shales and limestones, with some volcanic rock, mainly epidiorite. It did not occur to any great extent on the granite soils, and even on the umkondo it was not associated with the customary disappearance of the grass cover, which appeared normal. No deep pit was dug in the mopani soils, but to a depth of 2 feet the soil had a good structure and a pH of 7. The patches of mopani were found mainly near run-off water channels. The inference was drawn that this mopani soil was merely a stage in the development of the barren, grassless soil with an abnormal content of exchangeable sodium that had been found at Umgusa.

An isolated patch of mopani soil was found near Shamva in the Mazoe Valley where the mean annual rainfall is between 35 and 40 inches. The soil was derived from granite and consisted, as at Umgusa, of a sandy top soil of 2 or 3 inches overlying an alkaline (pH: 9.0) hard, compacted sub soil which contained 7 mg. eq. % of sodium (out of 34 mg. eq. % total exchangeable bases) and 0.134% of water-soluble salts.

Under conditions similar to those of Maranka Reserve, but on granite sands, further mopani soil was encountered at Romsley Estate with a few inches of sand on the surface, and a hard, compact, impervious, alkaline sub soil. Again the grass cover was scanty or non-existent and again the content of exchangeable sodium was abnormally high.

**Beatrice Area.** Twenty-eight miles from Salisbury, near Beatrice on the Beitbridge road, in a region of high rainfall and on granite sand, mopani suddenly appears. At the gate of Gowerlands farm, the property of Mr. Hodson, there are several tall trees and then for several miles mopani continues, though not in the dense stands found at Umgusa, and in the Sabi and Zambesi Valleys.

The mopani occurs in clumps, in most places on slightly raised mounds which appear to be old ant-hills. In other parts the trees occur on flat ground and characteristically the grass cover under the trees is poor. The most striking feature of the country is its extreme flatness; there is a gentle almost imperceptible slope to the west, to the Nyarakura river. At the southern end of the mopani area, along the main road, it is very obvious that as soon as the country becomes broken the mopani disappears. Inspection of the river bank showed solid sheets of granite at a depth of from 3′ to 4′, and the deduction was clear that conditions suitable for mopani had arisen because of the extreme flatness of the ground and the sheet of rock, which had combined to prevent drainage, and to bring about an accumulation of clay and salts just below the surface.

A pit sunk on very level ground, under grass and between clumps of mopani showed a sandy, slightly alkaline, top soil of 3″ overlying soil which became increasingly compacted, clayey, and alkaline with depth (Table II). There was a very marked difference between the lower layers as compared with those of a normal granite sand.

As a result of these observations in the field, and particularly as a result of the laboratory analyses, it was assumed that sodium was everywhere the cause of the formation of mature mopani soils. How these particular soils had become contaminated originally with sodium was not discovered, but it was reasoned that at depth there was a saucer of rock or some other impervious layer which had prevented normal drainage, but which, under our conditions of alternate wet and dry seasons, had brought about the gradual accumulation of sodium in the upper horizons. From such contaminated spots the evil effects of sodium impregnation could spread by surface wash to normally well drained soils. The impermeability of the soil, its high pH, and increased compaction could all be ascribed to the presence of significant exchangeable sodium. The mopani tree, which flourished in these soils, was thought to be resistant to alkalinity (sometimes very great), to the presence of soluble salts and to the physiological dryness in the lower horizons of soils which resulted from the dispersion when wet, and corresponding compaction when dry, of the sodium-impregnated colloids. This hypothesis fitted the known facts, apart from the soils under mopani trees at Maranka, which were not fully investigated, and were dismissed as merely an intermediate stage. The hypothesis fitted the facts until the investigation of the soils of the lower Sabi Valley proved that it could not account for the distribution of soils and vegetation in the low veld.

**Sabi Valley.** The lower Sabi Valley is a broad, flat plain between the Chipinga hills on the east and the hills running down from Bikita on the west. Birchenough Bridge (see Table 1) is at the upper end of the lower Sabi Valley. The soils which it is hoped to irrigate on the East Bank are of three main types, depending on their geological origins. The soils in the northern portion, below the Tanganda River, are derived from alluvium which is probably largely granitic in origin, but which is also affected by the umkondo of the fringing hills: there is a central belt of permian—fine, clinging sands derived from quartzites and sandstones, and finally, in the south, are the heavy, black basalt soils. The basalt soils are very heavy and rather shallow and the tree growth on them which is very sparse, probably on account of waterlogging, is confined mainly to *Acacia nigrescens* with some mopani and *Sclerocarya caffra.* The grass cover is very dense.

At first on travelling through the rest of the valley, through the alluvium, the permian, the granite and the fringing para-gneiss and umkondo (to name the soils by their parent material) the alternations in the vegetation are utterly bewildering. The two main types are a mixed acacia veld in which the dominant trees are *Acacia heteracantha* with *A. camplyacantha*, *A. albida*, *A. benthami*, *A. senegal*, *Euphorbia ingens*, *Pseudocadia zambesiaca*, and *Lonchocarpus capassa*, on the one hand, and *Copaifera mopane* on the other, and they appear to occur inextricably and inexplicably intermingled. Along the base of the hills the two types occur in successive belts, and on the alluvium on the floor of the valley there is a great central mass of mopani; while in the permian the mopani becomes increasingly prevalent. But the mopani itself is not uniform: some is normal, some is tall and park-like, some is stunted.

At the time of my original visit there had been a drought just previously and there was practically no grass anywhere, with the result that one of the usually characteristic signs of mopani veld was masked. But the ground, in spite of the low annual rainfall, seemed abnormally scored with runnels and channels. Pits sunk in some of the mopani soils and in the adjoining soils under mixed acacia showed very little difference apart from an increasing compaction with depth in the mopani soils. Analysis, too, failed to reveal any great differences or any appreciable concentration of soluble salts, except in the "pans," the waterlogged depressions in the mopani soils, which were themselves relatively treeless. In a typical "pan" the lower horizons had a water-soluble salt content of 0.384 % (the average for the subsoils of this area being about 0.05%) and a significantly high accumulation of transported clay in comparison with non-waterlogged mopani soils immediately adjoining.

The chief impressions after a hurried reconnaissance of the East Bank and analysis of the soils sampled were:

1. Very broadly speaking the tree types were represented by a mixed acacia veld and a mopani veld.

2. On the permian and the fringing umkondo and granite hills, belts of mopani alternated, apparently haphazardly, with belts of mixed acacia, whereas on the deep alluvium the mopani seemed to be confined to the vicinity of the central drainage system, an amorphous sprawling vlei where the rivers from the hills to the east gradually drowned in the sand.

3. Water-soluble salts, exchangeable sodium and a high pH were no longer the main distinguishing features of mopani soils, except in the depressions or "pans", which had been waterlogged.

4. There was little to distinguish the mixed acacia soils from some of the mopani soils, and there was nothing to indicate any inherent infertility in the mopani.

In connection with 4 it was noted that the natives in that area were not averse to using mopani soils for crops, in spite of the much denser growth of trees and the greater difficulty in stumping.

At the end of the following rainy season—in which good rains had been experienced—a flight over the same area gave a comprehensive picture of the vegetative growth and distribution. The two main types were very easily distinguished and many of the "pans" still had standing water. The following tentative, observations were made as a result of the aerial survey.

1. There was a marked difference from the air between acacia and mopani veld.

2. There was appreciably less grass growing under the mopani trees than under the mixed acacia trees.

3. The mopani soils were more eroded and more heavily scored by surface water than the mixed acacia soils.

4. The mopani seemed to dominate in lower-lying areas where there had been standing water.

5. Along the banks of well-defined streams and rivers there was no mopani.

6. Where mopani occurred it tended to do so in practically pure stand.

These observations would suggest that very considerable differences must exist between the habits of the vegetative types and the soils in which they grow, in spite of the fact that the previous reconnaissance had failed to reveal any. Accordingly when the reconnaissance of the West Bank was undertaken the procedure was modified. It was decided in the first place to sink pairs of pits, one in mixed acacia and the other in mopani as near as possible to each other, in all the main soil types. Secondly it was thought advisable to pay particular attention to the moisture status of the profile at the time of opening the pit. Previously owing to the exigencies of the work, a series of pits had been dug and these were examined and sampled as opportunity arose. But on the West Bank the moisture status was investigated at once, although the detailed description and the sampling were left until a more convenient time. Finally, wherever possible, the pits were sunk next to the characteristic tree of the area in an attempt to trace the root systems. (For pit descriptions of selected pits and analysis of samples see Appendix.)

It was at once obvious that the rooting system was of the greatest significance. The mopani tree has a very shallow rooting system: it has no main tap root but pushes out a great mass of radial roots, from a half to three or four inches in diameter, from four inches below the surface to about thirty inches. These roots may go down to about four feet at their extremities. From these radial roots smaller tap roots descend and presumably help to anchor the tree. All the space between the radial roots is filled with smaller roots and fine root hairs. This area of root development coincided with the zone of greatest soil moisture content, and of maximum water-holding capacity. That is to say that in mopani soil moisture penetrates to, and is held at, a relatively shallow depth. The acacia tree, although it can under favourable conditions, develop a spreading root system, is comparatively deep rooting with a large tap root; the obvious deduction, although no pit was deep enough to confirm it absolutely, is that in acacia veld the soil is more porous and better drained. and the water is accumulated at a greater depth than in the mopani veld. Field observations reinforced this conclusion.

**Discussion.** The shallow accumulation in mopani soils may be due to:

1. Very shallow soil with impervious rock below.

2. The presence of sufficient exchangeable sodium to disperse the clay.

3. The accumulation of transported clay below the surface forming a relatively impervious layer.

4. Low rainfall and great heat.

All these factors are very closely inter-related. The hypothesis —that the growth of mopani is due to a combination of an extremely shallow rooting system and of peculiar soil conditions best adapted to that system—fits all the known and observed facts. In the Sabi alluvium, which is naturally deep and porous, mopani only occurs in "pans" and along the central and other flat drainage systems, where the accumulation of run-off water, bearing silt and clay from higher ground, has eventually formed an impervious layer, and in addition (in the centre of the system), an accumulation of sodium. This occurs where the rivers from the hills have gradually disappeared in the sand, and the water, instead of being confined between banks, has spread over the surface of the soil. The effect is progressive: as the soil near the flow becomes clogged with clay (and sometimes sodium), as it becomes compacted and impervious, water will pass over the surface to affect adjoining ground. The impregnation with clay and the resulting tendency to imperviousness will vary according to circumstances, but generally speaking it will be greater, the greater the volume of transported water and the flatter the contour. Any drainage system will therefore exhibit more serious deterioration of soil conditions in its centre than on the edges.

Where the soil arises by natural soil-forming processes direct from the underlying rock, as on the granite, the umkondo, and the permian, the weathering will be shallow because of the lack of moisture in this area. The resulting general shallowness of the soil, with localised patches of alluvium, will bring about rapidly alternating belts of mixed, or acacia, veld, and mopani veld. Where the drainage is good and unimpeded, mixed vegetation will occur; where the soil is exceptionally porous and deep, deep rooting acacis such *A. heteracantha* will be largely found, but where the drainage is impaired and the moisture held not far from the surface, mopani will dominate. Passing along the foothills on the east of the valley the effect of the spilling of water is laid out in panorama. Where summer rivers come rushing out of the hills in well-defined river courses no mopani is to be seen anywhere in the vicinity. But where there is no river, where the water from the hills and higher ground spills down onto the shallow soils below, filling up the pore spaces with silt and clay, mopani at once marches in.

Mopani soils normally have a sandy, eluviated A horizon— the top soil—which may vary from an inch to six inches or more in depth. Grass may root in this soil but is unlikely to flourish as it does in normal soils because of the competition by the massed mopani roots for the available moisture and plant foods. This condition is known under other types of tree. Where the soil is quite barren of grass there may be two causes. In the first the concentration of soluble salts and exchangeable sodium is so high, that although a few inches of washed sand occur above the horizon of clay impregnation, grass cannot live. In the second, as found in the Sabi Valley, particularly on slopes, as the clay-impregnated layer becomes more impermeable, or as the grass thins, the top soil is washed away, and the resulting truncated soil, heavily scored with small erosion runnels and channels, is completely bare of surface vegetation. With the removal of the A horizon less and less water is absorbed by the exposed, compacted, impervious B horizon—the sub soil: grass cannot grow and the mopani remains stunted. It is fair to assume, where the mopani is tall and park-like, as it is in both the Sabi and Zambesi Valleys in places, that the original mopani-inducing conditions have not appreciably deteriorated and that considerable moisture penetrates to, and is held in, the mopani root zone. The impregnation with clay will often be to considerable depth and the zone of moisture accumulation may extend below the mopani roots. While there is adequate moisture for the mopani the tree will flourish: the deeper water may permit of the growth of other trees and shrubs if they can tolerate the alkaline conditions which usually occur in such circumstances.

It remains to discuss whether or not mopani soils are capable of cultivation, and more particularly, as they occur often in arid regions, of irrigation. It is obvious that the answer in every case will be affected by different circumstances. From the point of view of this paper the only circumstance to be considered is the particular reason for the shallow accumulation of soil moisture. The lower the rainfall and the greater the heat the more easily will the conditions for mopani arise, as unless the soil is very porous the moisture will not tend to penetrate to great depth. Under such conditions a comparatively light impregnation with transported or eluviated clay will be sufficient to retain the moisture in the upper levels. The higher the rainfall the greater will be the impregnation with clay, or sodium, or both (as they are under certain circumstances interdependent) necessary to bring about the conditions suitable for mopani. On the high veld sodium will usually be the causative agent and it is doubtful if for a long time to come the economic value of the land would justify the laborious and expensive treatment necessary to restore the soil. In the lower Sabi Valley, with its low rainfall and high temperatures, the conditions which encourage mopani will more easily arise and the soil will, or may, be only slightly abnormal. This is the case, except in flat areas of water accumulation such as the centre of the central drainage system of the alluvium, where the impregnation of centuries has produced a high concentration of sodium and of transported clay. At Chirundu in the Zambesi Valley, on the other hand, with its relatively high rainfall, preliminary investigations have indicated a marked deterioration of the soil where mopani is found. In the B horizon of one soil, for example, the pH was 10.1 and the soluble salt content was over 2%. Truncated soils bearing stunted mopani will be infertile because of the exposed B horizon, and the expense of regenerating them will only be justified under exceptional circumstances.

It has already been stated that in the Sabi Valley natives do stump and cultivate mopani soils. It is considered that if proper and recognised precautions are taken, if the land is drained and carefully worked, and the water correctly applied, irrigation can be successfully carried out over a considerable area of mopani soils in the lower Sabi Valley. Other mopani soils there, will, however, be completely unsuitable.

Some work has been done in this country on the relationship between soils and tree growth. The Sabi Valley with its uniform climatic conditions, its wide range of soils, and its irregular and puzzling distribution of mopani and mixed acacia veld, afforded an excellent opportunity for further study. The application of the results to varying climatic conditions and even wider ranges of soils offers interesting material for speculation. There are other species of tree of wide distribution in Africa and a study of their rooting systems and of the soils that support them might disclose a common denominator in each case which would make the task of the soil surveyor less arduous. The direct effect which climate, particularly as related to altitude, has been thought in the past to have on vegetation, might, on fuller investigation, prove to be due to soil factors, as in the case of mopani. There is here a wide field for further study and research.

## TABLE I

**Information relating to certain areas in which mopani was investigated.**

(Supplied by the Meteorological Office, Southern Rhodesia.)

| Meterological Station | Bulawayo | Gwaai | Chirundu | Birchenough Bridge |
|---|---|---|---|---|
| Altitude (feet) | 4405 | 3278 | 1280 | 1680 |
| Mean Annual Rainfall (inches) | 24.23 | 23.47 | 26.21 | 15.27 |
| Highest Recorded Annual Rainfall (inches) | 47.33 | 37.14 | 42.48 | 25.82 |
| Lowest Recorded Annual Rainfall (inches) | 7.85 | 10.22 | 12.58 | 8.19 |
| Mean Maximum Temperature (degrees F.) | 77.8 | 85.7 | 91.2 | 86.6 |
| Mean Temperature (degrees F.) | 65.5 | 70.1 | 78.5 | 73.1 |

**Note: Umgusa lies between Bulawayo and Gwaai, both geographically and meteorologically, but is nearer to the former.**

TABLE II

(Soils from Mopani area Gowerlands, Beatrice)

| Depth | | 15-25″ | 4-10″ | 0-3″ |
|---|---|---|---|---|
| Moisture % | | 2.3 | 1.2 | 0.6 |
| Loss on Ignition % | | 5.2 | 3.4 | 2.5 |
| Gravel % | | 4.2 | 0.8 | 0.9 |
| Coarse and Fine Sands % | | 47.1 | 68.4 | 87.5 |
| Silt % | | 7.8 | 5.8 | 5.5 |
| Clay % | | 42.8 | 24.6 | 6.4 |
| pH | | 9.8 | 9.7 | 7.9 |
| Water Soluble Salts % | | 0.2375 | 0.1355 | 0.0450 |
| Water Soluble Sodium % | | 0.0940 | 0.0310 | 0.0029 |
| Total Exchangeable Bases | Milligram Equivalents per 100 grm. | 23.2 | 15.5 | 6.2 |
| Exchangeable Calcium | | 3.2 | 5.9 | 3.4 |
| Exchangeable Magnesium | | 1.4 | 0.7 | 0.2 |
| Exchangeable Sodium | | 14.9 | 6.7 | 0.7 |
| Exchangeable Potassium | | 0.8 | 0.9 | 0.5 |
| Carbonate expressed as $CaCO_3$ % | | 1.123 | 0.189 | 0.011 |

## APPENDIX

### SABI WEST BANK

Three pits selected for description. These were in alluvium on Humani Ranch. Pit 5 was in mixed acacia veld adjoining mopani, represented by Pit 6; the two pits were about 200 yards apart. On examination it was decided that Pit 5 had been affected by the factors causing the establishment of mopani. Accordingly Pit 7 was sunk half-a-mile away in alluvium soil in mixed acacia veld, with fairly good grass cover, and with no mopani trees in the vicinity.

## PIT DESCRIPTIONS

**Pit 5** in soil derived from alluvium. Trees were mixed, with acacia dominant, and with only very isolated mopani: poor grass, due probably to over-grazing.

The profile showed a greyish-brown, acid, friable, light-bodied soil 0-5″, overlying a brown, neutral, fairly friable, prismatic, more clayey horizon extending to 23″, overlying a dark brownish-yellow, somewhat alkaline, less friable, fine-textured horizon with some carbonate concretions extending to the depth of the pit—65″. At the bottom were pieces of decomposing rock. Roots were numerous in the first 12″, less numerous thereafter, but isolated ones occurred to 65″.

When the pit was opened, horizon 0-5″ was dry, horizon 5-23″ slightly moist, and the horizon below 23″ very slightly moist.

**Pit 6** was sunk about 200 yards from Pit 5 in an area of pure mopani, 40 yards in from the edge: there was some grass and there were a few bushes. Mopani trees about 30-40′ tall.

The profile showed a brownish-grey, neutral, very friable, rather platey, medium-textured horizon 0-2″, overlying a grey, slightly alkaline, fairly friable, more clayey horizon extending to 8″, overlying a yellow-brown alkaline, compacted, blocky, clayey, horizon with iron stainings and numerous small pebbles, extending to 36″, overlying a greyish-yellow, alkaline, friable, fine-grained, less clayey light horizon containing fairly numerous carbonate concretions with slight iron staining and some minute pebbles and extending to the depth of the pit—60″. Roots occurred mainly in the horizons 2-8″ and 8-36″, the latter horizon containing all the large radial mopani roots.

When the pit was opened, horizon 0-2″ was dry, 2-8″ slightly moist, 8-36″ moist, and horizon 36-60″ very slightly moist.

**Pit 7.** As a result of these observations it was decided that Pit 5 showed too many of the characteristics of Pit 6, and that it was too close to the mopani to represent truly the mixed acacia veld. Accordingly Pit 7 was sunk about half-a-mile back towards the Homestead in mixed acacia veld, with fairly good grass cover, and with no mopani trees in the vicinity.

The profile showed a greyish-brown, acid, very friable, light textured horizon 0.7″, overlying a yellowish-brown, acid, moderately friable, medium textured horizon extending to 25″, overlying a dark yellowish-brown, acid, slightly compacted, nut structured, more clayey horizon extending to 34″, overlying a yellowish-brown, acid, compacted, nut structured, clayey horizon extending to the bottom of the pit—53″. Roots were numerous in the first horizon, less numerous in the second, and becoming fewer with depth.

When the pit was opened 0-7″ was dry. Below that horizon the soil appeared to be only very slightly moist throughout.

TABLE III

| Pit. No. | Depth | Vegetation | Gravel % | Combined Sands % | Silt % | Clay % | Air-dried Moisture % | Loss on Ignition % |
|---|---|---|---|---|---|---|---|---|
| 5 | 25-35″ | Mixed acacia | 2.2 | 53.0 | 18.0 | 24.0 | 5.0 | 4.0 |
| 5 | 10-20″ | adjoining | 1.3 | 41.2 | 8.4 | 45.0 | 5.4 | 4.3 |
| 5 | 0-4″ | Mopani of Pit 6 | 1.6 | 73.4 | 10.7 | 14.6 | 1.3 | 2.7 |
| 6 | 40-52″ | Mopani | 4.4 | 41.8 | 27.6 | 24.8 | 5.8 | 4.6 |
| 6 | 13-33″ | | 5.9 | 49.9 | 5.4 | 40.2 | 4.5 | 3.9 |
| 6 | 3-8″ | | 2.1 | 72.2 | 7.8 | 18.0 | 2.0 | 3.0 |
| 6 | 0-2″ | | 1.2 | 72.2 | 8.5 | 17.3 | 2.0 | 3.3 |
| 7 | 26-33″ | Mixed acacia | 2.3 | 43.0 | 8.8 | 44.8 | 3.4 | 5.0 |
| 7 | 10-20″ | | 1.6 | 64.1 | 6.5 | 27.6 | 1.8 | 3.8 |
| 7 | 0-6″ | | 1.1 | 79.2 | 5.6 | 14.4 | 0.8 | 2.4 |

## TABLE IV

| Pit No. | Depth | pH | Water Soluble Salts % | Total Exchangeable bases m.e. %† | Exchangeable Calcium m.e. %* | Exchangeable Sodium m.e. % | Exchangeable Potassium m.e. % |
|---|---|---|---|---|---|---|---|
| 5 | 25-35″ | 8.4 | .0855 | 34.9 | 24.8 | 0.63 | |
| 5 | 10-20″ | 7.1 | .0435 | 12.6 | 6.5 | 0.80 | 1.2 |
| 5 | 0-4″ | 6.7 | .0270 | 6.5 | 3.4 | | |
| 6 | 40-52″ | 8.5 | .0760 | 56.7 | 43.9 | | |
| 6 | 13-33″ | 8.3 | .0575 | 16.8 | 7.9 | 0.70 | 2.5 |
| 6 | 3-8″ | 8.2 | .0300 | 11.8 | 6.5 | | |
| 6 | 0-2″ | 7.5 | .0270 | 12.4 | 7.2 | | |
| 7 | 26-33″ | 5.9 | .0245 | 7.0 | 4.6 | | |
| 7 | 10-20″ | 5.4 | | 5.1 | 3.0 | 0.14 | |
| 7 | 0-6″ | 5.9 | | 3.8 | 2.7 | | |

† Includes Bases present as Carbonate

* Includes Calcium present as Carbonate

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*Lucerne Cyclostyled Number.

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6/33. No. 895. Annual Report of Experiments, 1931-32, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

6/35. No. 956. Annual Report of Division of Irrigation for 1934 by P. H. Haviland, B.Sc. (Eng.), Acting Chief Irrigation Engineer.

6/35. No. 957. Annual Report of the Branch of Plant Pathology for 1934 by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., Senior Plant Pathologist.

8/35. No. 962. Annual Report of Chief Entomologist for 1934, by R. W. Jack, Chief Entomologist.

9/35. No. 965. Annual Report of Experiments 1933-34, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

12/35. No. 974. Summary of Annual Report of Division of Forestry for 1934, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Chief Forest Officer.

5/36. No. 986. Annual Report of the Division of Entomology for 1935, by R. W. Jack, Chief Entomologist.

6/36. No. 992. Annual Report of the Agriculturist for the year 1935, by D. E. McLoughlin, Agriculturist.

7/38. No. 1076. Annual Report of Division of Forestry for 1937, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Conservator of Forests.

8/39. No. 1122. Annual Report of the Branch of Plant Pathology for 1938, by J. C. F. Hopkins, D.Sc. (Lond.) A.I.C.T.A., Senior Plant Pathologist.

4/40. No. 1149. Annual Report on Experiments, Agricultural Experiment Station, Salisbury, 1938-1939, by H. C. Arnold, Manager.

5/41. No. 1173. Annual Report of Experiments, 1939-1940, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

3-4/42, No. 1200. Witchweed Demonstration Farm. Costings, 1940-41, by S. D. Timson, M.C., Assistant Agriculturist, and G. L. Black, Manager.

5/42. No. 1204. Annual Report of Experiments, 1940-41, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

7-8/43. No. 1237. Annual Report of Experiments, 1941-42, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

7-8/44. No. 1268. Annual Report of Experiments, 1942-43, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

3-4/45. No. 1301. Annual Report of Experiments, 1943-44, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

7-8/45. No. 1311. Report of Secretary, Department of Lands, 1944.

9-10/45. No. 1319. Witchweed Demonstration Farm. Final Progress Report: December, 1944, by S. D. Timson, M.C., Agriculturist.

5-6/46. No. 1350. Annual Report of Irrigation Department for 1945.

7-8/46. No. 1355. Annual Report of Chief Animal Husbandry Officer for 1945.

7-8/46. No. 1357. Annual Report of Central Food Production Committee for 1945.

7-8/46. No. 1359. Annual Report of the Branch of Botany and Plant Pathology for 1945, by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., Senior Plant Pathologist.

7-8/46. No. 1360. Annual Report of Experiments, 1944-45, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

11-12/46. No. 1377. Annual Report, Division of Entomology, 1945, by J. K. Chorley, Chief Entomologist.

11-12/46. No. 1378. Annual Report of Chief Agriculturist, 1945, by D. E. McLoughlin, Chief Agriculturist.

1-2/47. No. 1383. Annual Report of Division of Forestry for 1945, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Conservator of Forests.

7-8/46. No. 1399. Annual Report of Experiments, 1945-46, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

7-8/47. No. 1404. Report of the Secretary, Department of Agriculture and Lands, 1946.

9-10/48. No. 1458. Annual Report of Experiments for 1946-47, Salisbury, Agricultural Experiment Station by H. C. Arnold, Manager.

11-12/48. No. 1459. Annual Report of Government Farms by D. E. McLoughlin, Chief Agriculturist.

1-2/49. No. 1468. Annual Report, Horticulturist for 1947, by C. N. Hayter, Horticulturist.

7-8/49. No. 1485. Summary of Annual Report of Department of Conservation and Extension for 1948, by C. A. Murray, Assistant Director Research and Specialist Services.

7-8/49. No. 1486. Summary of Annual Report of Chief Tobacco Officer for 1948, by D. D. Brown, Chief Tobacco Officer.

7-8/49. No. 1488. Summary of Annual Report of Chief Botanist and Plant Pathologist for 1948, by J. C. F. Hopkins, Chief Botanist and Plant Pathologist.

9-10/49. No. 1490. Annual Report of Experiments for 1947-48, Salisbury Agricultural Experiment Station, by A. G. H. Rattray, B.A.

## AGRICULTURAL AND FARM BUILDINGS.

11-12/45. No. 1326. *Construction of Dipping Tanks, by B. G. Gundry, A.I.Mech.E., and Notes on their Management, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

3-4/47. No. 1389. *Reinforced Brick Grain Bins, by Grain Bag Shortage Committee.

9-10/47. No. 1413. Electric Curing of Tobacco, by the Tobacco Research Board of Southern Rhodesia.

1-2/48. No. 1432. Buildings for Virginia Type Flue-cured Tobacco, by B. G. Gundry, Agricultural Engineer in collaboration with D. D. Brown, Chief Tobacco Officer.

9-10/48. No. 1455. Management of the Coal-burning Furnace for Tobacco Barns by Capt. C. E. Lowe, C.B.E., R.N., retired, Research Engineer, Tobacco Research Station, Trelawney.

5-6/49. No. 1480. A New Wood Furnace by Capt. C. E. Lowe, C.B.E., R.N., retired, Research Engineer, Tobacco Research Station, Trelawney.

5-6/49. No. 1481. A New Furnace Wall, by C. E. Lowe, C.B.E., R.N., retired, Research Engineer, Tobacco Research Station, Trelawney.

## CHEMISTRY.

1/34. No. 910. The Toxicity to Grazing Animals of Grass Sprayed with a solution of Sodium Arsenite by A. D. Husband, F.I.C., and J. F. Duguid, M.A., B.Sc.

5/35. No. 954. Experiments on the Toxicity to Fowls of Arsenite of Soda and Poisoned Locusts, by J. K. Chorley, F.R.E.S., and R. McChlery, B.A., B.Sc.

4/38. No. 1065. Nitrification in Red Soil in the Salisbury Area, by A. P. Taylor, M.A., B.Sc., and B. S. Ellis, B.Sc., A.I.C., D.I.C., Agricultural Chemists.

3-4/48. No. 1439. Seasonal Growth and Changes in Chemical Composition of the Herbage on Marandellas Sandveld, by H. Weinmann, D.Sc., Pasture Research Chemist.

11-12/49. No. 1498. Analyses of Rhodesia Foodstuffs, by the Chemistry Branch.

## CONSERVATION AND EXTENSION.

2/37. No. 1016. Natural Protection from Soil Erosion, by S. D. Timson, M.C., Agriculturist.

1/39. No. 1095. Soil and Water Conservation, by D. Aylen.

7/39. No. 1117. Soil and Water Conservation Part II, by D. Aylen.

9-10/49. No. 1492. *Gully Control, by K. J. Mackenzie, Senior Extension Officer.

## DAIRYING.

1/41. No. 1170. The Manufacture of Cheddar Cheese, by The Dairy Branch.

3-4/43. No. 1228. The Manufacture of Gouda Cheese, by The Dairy Branch.

3-4/44. No. 1260. The Dairying Industry, by The Dairy Branch.

5-6/44. No. 1264. Southern Rhodesia Milk Recording Scheme.

7-8/45, 9-10/45. No. 1321 Dairy Tests and Calculations, by The Dairy Branch.

7-8/47. No. 1400. Modern Milking, by The Dairy Branch.

7-8/47. No. 1401. The Dairying Industry, by J. R. Corry, B.Sc., Agric., Chief Dairy Officer.

7-8/47. No. 1405. *The Milking Shed, by The Dairy Branch.

3-4/48. No. 1438. Cheese Making in the Home, by The Dairy Branch.

Blue Prints of drawings of a Farm Dairy can be obtained from the Chief Dairy Officer.

9-10/48. No. 1454. How to Produce Clean Milk, by J. R. Corry, B.Sc. (Agri.), Chief Dairy Officer.

11-12/48. No. 1464. The Boltt Dairy Boiler, by The Dairy Branch.

3-4/49. No. 1473 Modern Milking Methods, by J. R. Corry, B.Sc. (Agri.), Chief Dairy Officer.

5-6/49. No. 1482. Farm Butter Making, by J. R. Corry, B.Sc. (Agri.), Chief Dairy Officer.

## ENTOMOLOGY.

12/24. No. 522. Notes on the Black Citrus Aphis, by C. B. Symes.

8/25. No. 548. Insect Pests of Cotton, by C. B. Symes.

9/25. No. 553. Observations on some injurious markings of Oranges, by C. B. Symes, Entomologist.

10/30. No. 796. The Army Worm *(Lachygma exempta)*, by R. W. Jack, Chief Entomologist.

7/30. No. 790. Notes on the Control of Some of the More Important Insect Pests of Citrus in Southern Rhodesia, by W. J. Hall, Ph.D., B.Sc., Entomologist to the British South Africa Company in Southern Rhodesia.

5/33. No. 893. Experiments with Tsetse Fly Traps against *Glossina morsitans* in Southern Rhodesia, by R. W. Jack, Chief Entomologist.

3/34. No. 913. Locusts: Instructions for dealing with Flying Swarms, by The Division of Entomology.

12/34. No. 938. The Destruction and Control of Locust Hoppers, by R. W. Jack, Chief Entomologist.

5/36. No. 986. Annual Report of the Division of Entomology for year ending 31st December, 1935, by Rupert W. Jack, Chief Entomologist.

2/38. No. 1059. A Poison Bait for Young Locust Hoppers.

9/38. No. 1082. The Life History of Root Gallworm or Root Knot Eelworm, by M. C. Mossop, M.Sc., Entomologist.

4/39. No. 1105. Fumigation with Hydrocyanic Acid Gas, by M. C. Mossop, M.Sc.

5/40. No. 1154. Host Plants of the Tobacco Aphis *(Myzus persicae)*, by Chas. K. Brain, M.A., D.Sc.

7/41. No. 1177. Tsetse Fly Operations: Short Survey of the Operations by Districts, by J. K. Chorley, Entomologist. Extracted from the Annual Report of the Chief Entomologist.

3-5/42. No. 1205. Ticks Infesting Domestic Animals in Southern Rhodesia, by Rupert W. Jack, Chief Entomologist.

7-8/42. No. 1208. Tsetse Fly Operations: Short Survey of the Operations by Districts, for the year ending December, 1941, by J. K. Chorley, Entomologist.

3-4/43. No. 1227. Plant Pests from Abroad, by M. C. Mossop, M.Sc., Entomologist.

11-12/43. No. 1249. On the Activity of the Tsetse *Glossina Pallidipes* and other Tsetse during a 24 hour period, by W. L. Williams, B.Sc., Entomologist.

3-4/44. No. 1259. Damage to Sapwood of Hardwoods by Powder-Post Beetles, by the Divisions of Forestry and Entomology.

11-12/44. No. 1283. Tsetse Fly Operations, 1943, by J. K. Chorley, Acting Chief Entomologist.

1-2/45. No. 1288. Orthezia Bug, by E. C. G. Pinhey, B.Sc., Entomologist.

11-12/45. No. 1331. Tsetse Fly Operations: Short Survey of the Operations by Districts for the year ending December, 1944, by J. K. Chorley, Acting Chief Entomologist.

1-2/46. No. 1340. The Olive Bug, by E. C. G. Pinhey, B.Sc., Entomologist.

9-10/46. No. 1365. Compost and White Grubs in Tobacco Lands, by B. L. Mitchell, B.Sc., Entomologist.

3-4/47. No. 1388. The Sun Hemp Beetles, by E. C. G. Pinhey, B.Sc., Entomologist.

3-4/48. No. 1436. The Use of Gammexane for the Control of White Grubs and Wire Worms in Tobacco Lands, by A. A. Moffet, Tobacco Research Station, Trelawney.

3-4/48. No. 1440. Control of Harvester Termites, by M. C. Mossop, M.Sc., Chief Entomologist.

1-2/49. No. 1470. Potato Tuber Moth, by M. C. Mossop, M.Sc., Chief Entomologist.

1-2/49. No. 1471. Termites in Gardens and Orchards, by M. C. Mossop, M.Sc., Chief Entomologist.

3-4/49. No. 1475. D.D.T. for Tobacco Warehouses and Store Rooms, by M. C. Mossop, M.Sc., Chief Entomologist.

9-10/49. No. 1489. Review of Tsetse Fly Situation in Southern Rhodesia in 1948, by J. A. Whellan, B.Sc.

11-12/49. No. 1495. Fruit Flies and Melon Flies, by M. C. Mossop, M.Sc., Chief Entomologist.

## FORESTRY.

4/33. No. 888. The Vegetable Ivory Palm *(Hyphaene ventricosa)*, by G. M. McGregor, B.Sc., District Forest Officer, Matabeleland.

3/37. No. 1018. Veld Fires. The Forest and Herbage Preservation Act, 1936, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Chief Forest Officer.

9/38. No. 1081. Uncontrolled Grass and Forest Fires and their Prevention by Rev. Father A. B. Burbridge.

7-8/44. No. 1269. Vermin and Notes on Methods of their Destruction, by the Vermin Conference Committee, assisted by E. Davison, Game Warden, Wankie Reserve.

7-8/45. No. 1313. Forestry Notes for Conservation Officers. Part I. The Relation of Forests to General Conservation and to Conditions in Southern Rhodesia, by E. J. Kelly-Edwards, Conservator of Forests.

9-10/45. No. 1320. Forestry Notes for Conservation Officers. Part II. Uses of Indigenous Forests, Wind Breaks, General Tree Planting, by E. J. Kelly-Edwards, Conservator of Forests.

11-12/46. No. 1375. Timber Preservation—Butt Treatment, by R. H. Finlay.

1-2/47. No. 1381. Pitsawing, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Conservator of Forests.

1-2/47. No. 1382 The Plot Planting of Eucalypts, by Major G. R. Wake, Vigila, Umvukwes.

3-4/47. No. 1391. *Some Trees, Shrubs, Shrubby-Herbaceous Plants, Climbers and Water Plants suitable for the Colony, by J. W. Barnes.

7-8/48. No. 1447. The Use of Timber in Fencing, by the Division of Forestry.

9-10/48. No. 1457. Sawmills, by G. R. Cameron, Forestry Division.

3-4/49. No. 1474. Wind Breaks and Shelter Belts, by A. A. Pardy, B.Sc.; B.Sc. (Forestry), Conservator of Forests (Research).

9-10/49. No. 1491. Raising and Planting of Trees on the Farm, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon), Chief Conservator of Forests.

11-12/49. No. 1500. Price-Lists of Forest-Tree Transplants, Ornamental Trees and Shrubs, Hedge Plants, Creepers and Seeds.

## HORTICULTURE.

1-2/44. No. 1255. The Commercial Culture of Cape Gooseberries, by R. G. Skipwith, Umtali.

7-8/47. No. 1408. Tung Nut Growing, by C. N. Hayter, F.Inst. P.A. (S.A.), Government Horticulturist.

7-8/48. No. 1448. Report on a Preliminary Reconnaissance of the Possibility of Cultivation of Tung Oil Trees in the Eastern Districts of S. Rhodesia, by C. C. Webster, Senior Agricultural Officer, Tung Experimental Station, Nyasaland, made at the request of the S.R.G. Natural Resources Board and Edited by C. N. Hayter, Horticulturist.

3-4/49. No. 1478. Strawberry Growing, by C. N. Hayter, Horticulturist.

11-12/49. No. 1499. Hydrangeas, by C. N. Hayter, Horticulturist.

*Propagation of Plants, by C. N. Hayter, Horticulturist.

*The Home Orchard, by C. N. Hayter, Horticulturist.

*Vegetable Growing, by C. N. Hayter, Horticulturist.

## IRRIGATION.

7-8/43. No. 1238. *A Reinforced Concrete Roof for Circular Reservoirs, by H. W. H. Wallis, B.Sc., Assoc.M.Inst.C.E., Assistant Irrigation Engineer.

7-8/46. No. 1358. Small Earthen Storage Dams, by the Irrigation Dept.

## LIVESTOCK.

5/36. No. 987. The Curing of Hides and Skins on the Farm, by The Division of Animal Husbandry.

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| 1/37. | No. 1012. | Export of Frozen Porkers and Baconers. Fourth Consignment of Smithfield, by Division of Animal Husbandry. |
| 4/37. | No. 1023. | Cowpea Molasses Silage for Fattening Steers, by C. A. Murray, M.Sc. (Agric.), Senior Animal Husbandry Officer in Charge, Matopo School of Agriculture and Experiment Station; A. E. Romyn, Ph.D., Chief Animal Husbandry Officer, Department of Agriculture, Salisbury; R. H. Fitt, Dipl. Agric., Animal Husbandry Officer, Department of Agriculture, Salisbury. |
| 12/37. | No. 1049. | The Export of Frozen Porkers: Report on Five Consignments of Porkers Exported to Smithfield, by Division of Animal Husbandry. |
| 11/38. | No. 1091. | Cost of Fattening Bullocks of various ages in Matabeleland, by A. E. Romyn and C. A. Murray. |
| 3-4/42. | No. 1198. | Soft Fat in Bacon Pigs, by C. A. Murray, Division of Animal Husbandry. |
| 5-6/46. | No. 1351. | Feeding of Dairy Cows, by the Division of Animal Husbandry. |
| 7-8/46. | No. 1354. | Winter Cereal Grazing for the Production of Fat Lambs—Press Service, Department of Agriculture, Pretoria. |
| 7-8/47. | No. 1403. | *Sheep and Their Management in Southern Rhodesia, by C. A. Murray, Chief Animal Husbandry Officer. |
| 11-12/47. | No. 1428. | *Cattle Bale or Grip, by B. G. Gundry, Agricultural Engineer. |
| 4-6/48. | No. 1444. | *Care and Management of a Dairy Herd and the Making of Compost, by I. M. Krige, B.Sc. (Agric.), Animal Husbandry Officer, with Notes on the Making of Compost by S. D. Timson, M.C., Agriculturist. |
| 3-4/49. | No. 1477. | *The Raising of Bacon Pigs, by A. E. Romyn, Ph.D., C. A. Murray, M.Sc. (Agric.) and a Veterinary Section by D. A. Lawrence, B.V.Sc. |

## METEOROLOGICAL.

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| 12/24. | No. 524. | These of an Aneroid Barometer, by C. L. Robertson, B.Sc., A.M.I.C.E. |
| 10/28. | No. 712. | The Time, and How to Find It, by N. P. Sellick, M.C., B.Sc. (Eng.). |

## PASTURES.

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| 2/37. | No. 1016. | Natural Protection from Soil Erosion, by S. D. Timson, M.C., Assistant Agriculturist. |
| 9/38. | No. 1081. | Uncontrolled Grass and Forest Fires and their Prevention, by the Rev. Father A. B. Burbridge, S.J. |
| 9-10/46. | No. 1366. | Report on Tour of Pasture Research Stations in Union of South Africa, by J. M. Rattray, M.Sc., Pasture Research Chemist. |
| 9-10/46. | No. 1367. | Some Fundamental Aspects of Modern Pasture Management, by H. Weinmann, Dr. Agric, M.Sc., Pasture Research Chemist. |
| 1-2/47. | No. 1384. | Prelim. Results in Improving the Sandveld Vleis on the Grassland Experiment Station, Marandellas, by J. M. Rattray, Pasture Research Officer, and R. H. Fitt, Animal Husbandry Officer. |

7-8/47. No. 1409. Giant Rhodes Grass Pastures at Trelawney, by J. M. Rattray, M.Sc., Pasture Research Officer.

9-10/47. No. 1417. Thorn Bush Encroachment in Relation to the Management of Veld Grazing, by O. West, D.Sc., Pasture Research Officer.

11-12/48. No. 1429. Umgusanne *(Dichapetalum cymosum)*, by O. West, D.Sc., Pasture Research Officer.

3-4/48. No. 1439. Seasonal Growth and Changes in Chemical Composition of the Herbage on Marandellas Sandveld, by H. Weinmann, D.Sc., Pasture Research Chemist.

5-6/48. & 7-8/48. No. 1446. *Pasture Research in S. Rhodesia: Progress Report (1945-47), by the Division of Pasture Research.

11-12/48. No. 1461. Improved Dryland Pastures, by J. M. Rattray, M.Sc., Senior Pasture Research Officer, Grassland Experiment Station, Marandellas.

5-6/49. No. 1484. Productivity of Marandellas Sandveld in Relation to Frequency of Cutting, by H. Weinmann, Dr. Agric., D.Sc., Pasture Research Chemist.

## PLANT PATHOLOGY AND BOTANY.

### PLANT PATHOLOGY.

9/29. No. 754. "Pinking" of Maize: Report of a Preliminary Investigation, by T. K. Sansom, B.Sc., Plant Breeder.

6/33. No. 894. Mycological Notes—Seasonal Notes on Tobacco Diseases. An unusual type of Frog Eye Spotting by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.

1/35. No. 942. Mycological Notes. Seasonal Notes on Tobacco Diseases. 8, The Mosaic Mystery. 9, Danger Points in Field Spraying, by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., Senior Plant Pathologist.

6/38. No. 1074. A Note on a Stem Rot of Sweet Peas, by J. C. F. Hopkins, D.Sc., A.I.C.T.A., Senior Plant Pathologist.

10/39. No. 1128. Mycological Notes. 12. The Diplodia Danger, by J. C. F. Hopkins, D.Sc., A.I.C.T.A., Senior Plant Pathologist.

11/39. No. 1132. Mycological Notes 13. The Diplodia Danger by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.

12/39. No. 1134. Mycological Notes. 14. Seasonal Notes on Plant Diseases, by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., Senior Plant Pathologist.

8/41. No. 1180. Diseases of Fruit, Flowers and Vegetables in Southern Rhodesia: 3, Common Diseases of Snapdragons, by J. C. F. Hopkins, D.Sc., (Lond.), A.I.C.T.A., Senior Plant Pathologist.

9-10/42. No. 1213. Diseases of Fruit, Flowers and Vegetables in Southern Rhodesia: No. 6. 'Virus Diseases of Cabbages and Cauliflowers, by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., and Marie H. Pardy, B.Sc., Branch of Plant Pathology.

1-2/43. No. 1226. Mycological Notes. No. 16. The campaign against Kromnek Virus, by J. C. F. Hopkins, D.Sc., (Lond.), A.I.C.T.A., Senior Plant Pathologist.

3-4/44. No. 1257. Diseases of Fruit, Flowers and Vegetables in S.R. No. 8, "The Yellows Disease of Cabbage," by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., and Marie H. Pardy, B.Sc.

## BOTANY..

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| 10/33. | No. 905. | Notes on African Aloes (Parts 7-10), by H. Basil Christian, "Ewanrigg," Arcturus. |
| 1-2/45. | No. 1284. | Botanical Specimens for Identification — Correct Methods of Collecting and Despatching, by the Division of Botany and Plant Pathology. |
| 11-12/46. | No. 1379. | Upright Star-Bur. A New Method of Control, by H. Wild, Ph.D., D.I.C., Division of Botany and Plant Pathology. |
| 5-6/47. | No. 1393. | The Eastern Districts Senecio Problem, by H. Wild, Ph.D., D.I.C., Division of Botany and Plant Pathology. |
| 5-6/48. | No. 1443. | A Suggestion for the Control of Tobacco Witchweed *(Striga gesneriodes* (Willd) Vatke) by Leguminous Trap-Crops, by H. Wild, Ph.D., D.I.C., Branch of Botany and Plant Pathology. |

## POULTRY.

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| 3/27. | No. 635. | Ovarian Troubles, by A. Little, Poultry Expert. |
| 11-12/46. | No. 1376. | Ducks on the Farm, by H. G. Wheeldon, Poultry Officer. |
| 3-4/47. | No. 1390. | *The Artificial Incubation, Brooding and Rearing of Chickens, by H. G. Wheeldon, Poultry Officer. |
| 5-6/47. | No. 1394. | The Moult, by H. G. Wheeldon, Poultry Officer. |
| 11-12/47. | No. 1423. | Control of Poultry Parasites, by A. A. Reed, Assistant Poultry Officer. |
| 11-12/47. | No. 1427. | Feeding and Drinking Appliances for Poultry, by G. H. Cooper, Assistant Poultry Officer. |
| 1-2/48. | No. 1431. | *Breeding of Poultry for Economic Qualities, by A. A. Reed, Assistant Poultry Officer. |
| 9-10/48. | No. 1452. | Management of Young Poultry Stock, by G. H. Cooper, Chief Poultry Officer. |
| 11-12/48. | No. 1465. | *Feeds for Poultry and How to Use Them, by G. H. Cooper, Chief Poultry Officer. |
| 1-2/49. | No. 1467. | The Turkey, by G. H. Cooper, Chief Poultry Officer. |
| 3-4/49. | No. 1476. | *Trap Nests, by The Poultry Branch |
| 9-10/49. | No. 1493. | *Housing and Feeding of Adult Poultry Stock, by H. G. Wheeldon. |

### PAMPHLETS.

The following pamphlets can be obtained from the Poultry Officer upon application :—

Chicken-pox, by The Poultry Branch.

Condition of Birds on Show, by A. Little, Poultry Expert.

Diseases of the Liver, by The Poultry Branch.

Respiratory Diseases of Poultry, by The Poultry Branch.

Poultry Rations, by The Poultry Branch.

## TOBACCO.

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| 12/36. | No. 1009. | Tobacco Research on the Trelawney Station, 1935-36 Season. |
| 11-12/46. | No. 1365. | Compost and White Grubs in Tobacco Lands, by B. L. Mitchell, B.Sc., Entomologist. |

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| 9-10/46. | No. 1369. | The Culture of Virginia Type Tobacco in Southern Rhodesia: Field Operations, by D. D. Brown, Chief Tobacco Officer. |
| 1-2/47. | No. 1385. | Tobacco Culture in Southern Rhodesia: Harvesting and Curing Virginia Type Tobacco, by D. D. Brown, Chief Tobacco Officer. |
| 9-10/47. | No. 1414. | Tobacco Culture in Southern Rhodesia—Seed-beds, by D. D. Brown, Chief Tobacco Officer. |
| 11-12/47. | No. 1420. | Dark Fire-cured Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Officer. |
| 11-12/47. | No. 1424. | The Use of Compost for Flue-cured Tobacco. Part I. Field Trials, by A. A. Moffet, Tobacco Research Station, Trelawney. |
| 3-4/48. | No. 1436. | The Use of Gammexane for the Control of White Grubs and Wire Worms in Tobacco Lands, by A. A. Moffet, Tobacco Research Station, Trelawney. |
| 5-6/48. | No. 1443. | A Suggestion for the Control of Tobacco Witchweed *(Striga gesnerioides* (Willd) Vatke), by Leguminous Trap-Crops, by H. Wild, Ph.D., D.I.C., Branch of Botany and Plant Pathology. |
| 11-12/48. | No. 1460. | Turkish Tobacco in Southern Rhodesia, by D. D. Brown, Chief Tobacco Officer. |
| 3-4/49. | No. 1472. | Preliminary Notes on Cigar Tobacco Culture, by D. D. Brown, Chief Tobacco Officer. |

## VETERINARY.

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|---|---|---|
| 12/25. | No. 570. | The Spraying of Bovines, by G. C. Hooper Sharpe, M.C,. M.R.C.V.S., and M. H. Kingcombe, M.R.C.V.S. |
| 1/28. | No. 666. | Notes from the Veterinary Laboratory: Praemonitus —Praemunitus, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research. |
| 4/31. | No. 819. | Measles in Swine, by P. D. Huston, M.R.C.V.S. |
| 3-4/42. | No. 1197. | Laboratory Diagnosis of Disease. Part II. Submission of Specimens, by J. M. Williamson, B.Sc., M.R.C.V.S. |
| 11-12/45. | No. 1326. | *Construction of Dipping Tanks, by B. G. Gundry, A.I.Mech.E., and Notes on their Management, by J. M. Sinclair, M.R.C.V.S. |
| 1-2/46. | No. 1338. | Internal Parasites in Sheep and Cattle, by Percy D. Huston, M.R.C.V.S., Chief Veterinary Surgeon. |
| 9-10/46. | No. 1362. | Carbon Tetrachloride for the Treatment of Liver Fluke and Hookworm, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 9-10/46. | No. 1364. | Tick Transmission of Disease, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 11-12/46. | No. 1374. | Sweating Sickness, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 5-6/47. | No. 1392. | Quarter Evil, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 5-6/47. | No. 1397. | Scheduled Diseases of Stock in Southern Rhodesia, by the Veterinary Department. |
| 11-12/48. | No. 1462. | Laboratory Diagnosis of Disease, Preparation of Smears, by J. M. Williamson, B.Sc., M.R.C.V.S., Veterinary Research Department. |

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|---|---|---|
| 11-12/48. | No. 1468. | Tick Transmission of Disease, by D. A. Laurence, B.V.Sc., Director Veterinary Research. |
| 1-2/49. | No. 1469. | African Coast Fever, by Veterinary Department. |

## MISCELLANEOUS.

| | | |
|---|---|---|
| 4/28. | No. 686. | The Land Bank, Its Functions and How it Operates, by S. Thornton. |
| 5/31. | No. 820. | The Great Economic Problem in Agriculture—No. 1, by J. R. McLoughlin, M.Sc. (Economist), Economic Adviser. |
| 9/38. | No. 1081. | Uncontrolled Grass and Forest Fires and their Prevention, by the Rev. Father A. B. Burbridge, S.J. |
| 4/39. | No. 1107. | Some Notes on Game Bird Preservation, by W. E. Poles, Esq., on behalf of the Wild Life Protection Society of Southern Rhodesia. |
| 6/39. | No. 1114. | The Rhodes Inyanga Estate. |
| 9-10/45. | No. 1316. | Post-war Land Settlement in Southern Rhodesia. |
| 11-12/45. | No. 1328. | Baited Fly Traps, by Dr. D. M. Blair, Public Health Department, Salisbury. |
| 11-12/45. | No. 1330. | Control of the Snail Hosts of the Bilharzia Parasites, by Dr. D. M. Blair, Public Health Department, Salisbury. |
| 1-2/46. | No. 1335. | Brick-making on the Farm, by A. C. Jennings, Assoc. Mem. Inst. C.E. |
| 3-4/46. | No. 1344. | Baited Fly Traps (Supplement), by Dr. D. M. Blair, Public Health Department, Salisbury. |
| 3-4/46. | No. 1347. | How to make use of the Fencing Law and Preservation of Farm Beacons, by the Lands Department and L. M. McBean, Surveyor General. |
| 9-10/46. | No. 1363. | The Coverage of Tractor-Drawn Implements, by E. J. Waring, B.Sc.Agr., reprinted from Agricultural Journal, N.S.W. |
| 11-12/46. | No. 1371. | Drying of Green Peas, by P. Wissing, Dehydration Officer. |
| 7-8/47.<br>9-10/47. | No. 1410. | *Farming Calendar, by Officers of the Department of Agriculture. |
| 7-8/47.<br>9-10/47. | No. 1411. | Some Hints for Anglers on Fish Pests, by R. M. R. Stevenson, F.R.E.S. |
| 11-12/47. | No. 1421. | A Start in Book-keeping, by S. M. Makings, Chief Agricultural Economist. |
| 1-2/48. | No. 1434. | *How to Instal a Simple and Efficient Hot Water Supply on a Farm, by W. A. Welch, Salisbury. |
| 5-6/48. | No. 1442. | Farm Planning, by K. J. Mackenzie, Senior Extension Officer. |
| 7-8/48. | No. 1451. | *A Charcoal Safe or Cooler. |
| 9-10/49. | No. 1494. | Protection of Birds in S. Rhodesia, by R. A. Jubb. |
| 11-12/49. | No. 1497. | Birds of Prey, by Capt. James, Hon. Ornithologist, Queen Victoria Memorial Museum. |
| 11-12/49. | No. 1501. | Some Notes on Freshwater Fishes in Southern Rhodesia by R. A. Jubb, B.Sc. |

# Southern Rhodesia Veterinary Report

NOVEMBER, 1949

**General.** The water position and grazing were reported to have improved in the Gwelo, Fort Victoria and Melsetter Districts with the advent of rain, but little improvement was reported in the Salisbury, Bulawayo and Umtali Districts. The condition of cattle remained poor in all Districts, with the exception of Melsetter.

**Tick Life.** Tick Life was active. The following quarantine notices were issued during the month: Salisbury 14; Umtali 8; Gwelo 2; Fort Victoria 2. Owing to the shortage of water, compulsory dipping had to be suspended in many areas.

## SCHEDULED DISEASES:

1. **African Coast Fever.** No further cases occurred in the Salisbury District.

2. **Theileriosis.** Urungwe Reserve in the Salisbury District is still in quarantine.

3. **Antrhax.** 80 Head were inoculated in the Salisbury District, and 600 in the Fort Victoria District.

4. **Foot and Mouth Disease.** Nil.

5. **Glanders or Farcy.** Nil.

6. **Heartwater.** Four cases were reported in the Bulawayo District.

7. **Lungsickness (Contagious Pleuro Pneumonia of Cattle).** Nil.

8. **Mange in Horses, Mules, Donkeys and Camels.** Nil.

9. **Pyaemia or Epizootic Lymphangitis.** Nil.

10. **Redwater.** One case was reported in the Salisbury District, and three cases in the Melsetter District.

11. **Rinderpest.** Nil.

12. **Swine Erysipelas.** Nil.

13. **Swine Fever.** Nil.

14. **Quarter Evil.** Cases were reported in the following Districts: Salisbury 3; Bulawayo, Gwelo 4; Fort Victoria 8; Melsetter 5.

15. **Tuberculosis.** Nil.

16. **Scab.** Nil.

17. **Rabies.** Nil.

18. **Senkobo Disease.** Nil.

19. **Trypanosomiasis.** Of 1,107 Head of cattle smeared in the M'Koto Reserve, 43 were positive to *T. congolense* and 6 to *T. vivax.*

20. **Contagious Epididymitis and Vaginitis (Epi-Vag).** Three new centres of infection were found in Salisbury District, one of which was in Lomagundi, one in Marandellas and the other on a plot at Hatfield which is already in the infected area. 4 centres were diagnosed in Bulawayo District. These were all in the Wankie area which up to now had not had a close inspection.

21. **Lumpy Skin Disease.** Few very mild cases noted in the Gwelo District.

22. **Contagious Abortion.** Cases were reported in the following Districts: Salisbury 5; Bulawayo 4; Gwelo 5; Melsetter 8.

## SCHEDULED POULTRY DISEASES:

23. **Spirochactosis.** Nil.

24. **Coccidiosis.** Nil.

25. **Fowl Typhoid.** Nil.

26. **Bacillary White Diarrhoea.** Nil.

27. **Tuberculosis.** Nil.

28. **Chicken Pox and Roup.** Cases were diagnosed in the Gwelo District and were successfully treated.

## OTHER DISEASES:

29. **Gallsickness.** Cases were confirmed in the following Districts: Salisbury 2; Umtali 3; Gwelo (many); Melsetter 2.

30. **Paratyphoid.** Nil.

31. **Geilsiekte.** Nil.

32. **Horse Sickness.** Nil.

33. **Biliary.** 1 case was confirmed in the Salisbury District.

34. **Sweating Sickness.** Occurred in the Bulawayo and Gwelo Districts.

35. **Ophthalmia.** Prevalent in all Districts with the exception of Umtali.

36. **Screw Worm.** Reported in all Districts with the exception of Umtali.

37. **Coccidiosis.** Two cases occurred in the Salisbury District.

38. **Internal Parasites.** The eradication of Liver Fluke in the Melsetter District received attention.

## POISONING:

39. **Veld Poisoning.** Cases occurred in all Districts with the exeeption of Umtali.

40. **Mineral Poisoning.** The following deaths from Arsenical Poisoning were reported: Salisbury 4; Bulawayo 1; Gwelo 2; Fort Victoria 7.

**Mallein Testing.** In October, 1949, 40 Horses, 46 Mules; and in November, 1949, 49 Horses and 80 Mules were tested. All passed.

**Tuberculin Testing.** In October, 1949, 58 Bulls, 9 Cows, 21 Heifers; and in November, 1949, 27 Bulls, and 30 Heifers were tested. All passed.

## IMPORTATIONS:

**Union of South Africa.** 27 Bulls (Breeding); 25 Cows and Calves (Breeding); 14 Horses and Mares; 31 Geldings; 4 Mules; 82 Sheep (Breeding).

**Northern Rhodesia.** 1 Gelding.

**Bechuanaland Protectorate.** 343 Goats (Slaughter); 19 Pigs (Slaughter); 94 Sheep (Slaughter).

## EXPORTATIONS:

**Portuguese East Africa.** 10 Cows and Calves (Breeding); 60 Oxen (Slaughter).

**Northern Rhodesia.** 3 Sheep (Breeding); 34 Donkeys; 21 Cows and Calves (Breeding); 14 Goats (Breeding).

**Union of South Africa.** 80 Donkeys; 1 Horse and Mare.

**Nyasaland.** 5 Geldings.

**Belgian Congo.** 3 Pigs (Breeding).

## EXPORTATIONS—MISCELLANEOUS:

### In Cold Storage:

**Belgian Congo.** 10,599 lbs. Beef; 418 lbs. Bacon Ham; 550 lbs. Pork; 1,286 lbs. Casings.

**United Kingdom.** 12,586 lbs. Medicinal Glands; 176,240 lbs. Liquid Eggs.

**Northern Rhodesia.** 26,225 lbs. Bacon Ham.

**Union of South Africa.** 5,402 lbs. Casings; 3 Gallstones.

**Bechuanaland Protectorate.** 424 lbs. Bacon.

### Meat Products from Liebigs (Rhodesia), Ltd., West Nicholson:

**Union of South Africa.** 8,250 lbs. Vienna Sausages; 7,800 lbs. Curried Beef; 30,000 lbs. Braised Steak; 15,600 Braised Steak and Onions; 1,500 Potted Beef.

**Belgian Congo.** 44,280 lbs. Corned Beef.

P. D. HUSTON,
Director of Veterinary Services.

# Rhodesian Milk Records

## OFFICIAL MILK RECORDS.

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Dalham Christina | Jersey | Sen. 3 years | 8008.00 | 365.67 | 4.56 | 300 | S. Gelman, 27, Baxendale St., Bulawayo. |
| Voullaire Augusta | Jersey | 18 months | 4590.00 | 190.32 | 5.30 | 300 | |
| Beauty's Harmony of Wanganella | Guernsey | Mature | 4250.50 | 241.78 | 5.69 | 293 | Hards & Liddle, Churchill Farm, Marandellas. |
| Gipsy's Heather of Wanganella | Guernsey | Jun. 4 years | 5630.00 | 309.89 | 5.50 | 299 | |
| Molly's Rosea of Wanganella | Guernsey | Mature | 4318.00 | 212.04 | 4.91 | 270 | |
| Criterion Marion V | Friesland | Jun. 4 years | 12554.00 | 429.56 | 3.42 | 300 | J. Jamieson, Criterion Farm, Box 217, Bulawayo. |
| Meadows Dainty V | Jersey | Sen. 4 years | 7096.00 | 366.78 | 5.17 | 300 | J. H. Keightley, Moorfields, Glendale. |
| Whinburn Angela | Friesland | Mature | 14448.20 | 499.17 | 3.45 | 300 | Major R. R. Sharp, Whinburn, Redbank, Bulawayo. |
| Whinburn Colleen | Friesland | Jun. 3 years | 6856.10 | 255.12 | 3.72 | 300 | |
| Whinburn Dainty | Friesland | 2 years | 6663.00 | 245.53 | 3.68 | 300 | |
| Whinburn Chalice | Friesland | 2 years | 6178.90 | 220.24 | 3.56 | 277 | |
| Whinburn Destiny | Friesland | 2 years | 5346.90 | 190.26 | 3.56 | 300 | |
| O'Kay Sweet Jane | Jersey | 2 years | 3189.00 | 154.35 | 4.84 | 255 | S. M. Sinclair, Albany, P.B. Melsetter. |
| Lynmouth Valiant Belladonna | Jersey | Jun. 3 years | 3021.00 | 170.44 | 5.64 | 240 | |
| Meadows Double Win II | Jersey | 21 months | 4872.50 | 283.56 | 5.82 | 278 | Miss B. Tracey, P.O. Box 1750, Salisbury. |
| Meadows Golden Winsome | Jersey | 21 months | 4980.00 | 297.00 | 5.96 | 300 | |

## SEMI-OFFICIAL MILK RECORDS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sarie | G. Jersey | 23 months | 4937.60 | 270.10 | 5.47 | 300 | Lord Acton, M'bebi, Mazoe. |
| Bebi | G. Friesland | Mature | 7304.60 | 232.21 | 3.17 | 239 | D. A. Allan, Doctors Gift, P.O. Theydon. |
| Boy | G. Friesland | Mature | 8422.30 | 276.86 | 3.28 | 254 | |
| Joy | G. Friesland | 2 years | 8814.10 | 307.50 | 3.49 | 300 | |
| Kambusi | G. Friesland | Mature | 8982.30 | 299.62 | 3.33 | 230 | |
| Victoria | G. Friesland | Mature | 6715.90 | 229.77 | 3.42 | 170 | |
| Sonia | G. Friesland | Mature | 6415.50 | 226.01 | 3.52 | 187 | Mrs. M. Allan, Doctors Gift, P.O. Theydon. |
| No. 69 | G. Friesland | Mature | 6084.10 | 229.53 | 3.77 | 283 | G. R. Anderson, Warrender Farm, Box 8, Gwelo. |
| Mabeka | G. Friesland | Mature | 9087.60 | 303.66 | 3.34 | 300 | C. A. Austen, Box 115, Que Que. |
| Rose | G. Friesland | Mature | 6107.70 | 233.31 | 3.82 | 273 | |
| Bart | G. Friesland | Mature | 7696.00 | 300.36 | 3.90 | 300 | R. A. Ballantyne, Box 801, Salisbury. |
| Castor Oil | G. Friesland | Mature | 7639.00 | 286.34 | 3.74 | 300 | |
| Clara | G. Friesland | Mature | 7607.00 | 301.89 | 3.96 | 300 | |
| Flotsam | G. Friesland | 3 years | 5837.00 | 227.55 | 3.90 | 300 | |
| Fortune | G. Friesland | 3 years | 7123.00 | 264.95 | 3.58 | 300 | |
| No. 173 | G. Friesland | 4 years | 5095.00 | 267.55 | 5.25 | 300 | |
| Jane | G. Shorthorn | 3 years | 6338.30 | 265.55 | 4.19 | 280 | J. H. Barry, Enavant, P.B. Umtali. |
| Mollianda | G. Shorthorn | 4 years | 5926.30 | 240.14 | 4.05 | 300 | |
| Campos | G. Friesland | Mature | 6555.90 | 280.80 | 4.28 | 282 | J. A. Baxter, Glen Norah, Box 1368, Salisbury. |
| Charles Hixon | G. Friesland | Mature | 6225.00 | 264.35 | 4.25 | 300 | |
| Crissie | G. Friesland | 4 years | 7826.00 | 256.28 | 3.27 | 300 | |
| Dongera | G. Friesland | Mature | 7590.00 | 287.93 | 3.79 | 300 | |
| Door | G. Friesland | Mature | 8677.00 | 304.45 | 3.51 | 300 | |
| Japa | G. Friesland | Mature | 8436.70 | 286.20 | 3.39 | 300 | |
| Japan | G. Friesland | Mature | 10060.70 | 303.33 | 3.02 | 300 | |
| Sophia | G. Friesland | Mature | 10258.50 | 330.38 | 3.22 | 300 | |
| Store | G. Friesland | Mature | 6578.20 | 253.94 | 3.86 | 300 | |
| Window. | G. Friesland | Mature | 8615.50 | 301.26 | 3.49 | 300 | |
| D. 227 | G. Friesland | 3 years | 7504.10 | 249.74 | 3.33 | 294 | A. L. Bickle, Box 595, Bulawayo. |
| Destiny V | G. Friesland | Mature | 5589.50 | 234.72 | 4.20 | 300 | Mrs. M. Black, Burnside, P.O. Bindura. |
| Jutice III | G. Friesland | 4 years | 6497.00 | 245.99 | 3.79 | 300 | |
| Punch I | G. Friesland | Mature | 6857.00 | 262.19 | 3.82 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Bindura | G. Friesland | Mature | 7376.70 | 269.79 | 3.66 | 300 | Bothashof School, P.B. 164H, Salisbury. |
| Lena | G. Friesland | Mature | 6350.60 | 246.92 | 3.89 | 300 | |
| Liefling | G. Friesland | Mature | 9782.10 | 307.15 | 3.14 | 300 | |
| Corrie | G. Friesland | Mature | 7553.30 | 262.88 | 3.48 | 300 | |
| Juliana | G. Friesland | Mature | 7666.80 | 272.09 | 3.55 | 300 | |
| Selukwe | G. Friesland | Mature | 7020.30 | 251.91 | 3.59 | 300 | |
| Witmuis | G. Friesland | Mature | 6712.70 | 248.76 | 3.71 | 300 | |
| Signora IV | G. Friesland | 4 years | 8458.00 | 274.43 | 3.25 | 291 | C. Boyd Clark, Mount Zonga, Inyazura. |
| Laura III | G. Friesland | 3 years | 7395.00 | 238.16 | 3.22 | 300 | |
| No. 249 | G. Friesland | Mature | 7135.00 | 293.33 | 4.11 | 300 | |
| Grove Park Shorty II | G. Friesland | 3 years | 9340.00 | 295.48 | 3.16 | 300 | Bradley Bros., P.O. Box 699. Bulawayo. |
| Conna | G. Friesland | Mature | 4911.50 | 233.07 | 4.74 | 300 | J. D. Bredenkamp, P.O. Box 13, Salisbury |
| Dishman | G. Jersey | Mature | 6155.50 | 311.33 | 5.06 | 300 | |
| Gova | G. Friesland | Mature | 4751.80 | 234.71 | 4.93 | 300 | |
| Isak | G. Friesland | Mature | 5088.30 | 233.10 | 4.58 | 300 | |
| Mealies | G. Friesland | Mature | 5078.80 | 322.01 | 4.33 | 264 | |
| Stella | G. Friesland | 4 years | 7184.00 | 331.31 | 4.61 | 300 | |
| White | G. Friesland | Mature | 6240.20 | 227.52 | 3.64 | 300 | |
| Clara | G. Guernsey | Mature | 5818.00 | 238.37 | 4.10 | 264 | Miss N. Brereton, Coolmoreen, Gwelo. |
| Mastori | G. Friesland | Mature | 6734.00 | 252.63 | 3.75 | 261 | |
| Mshopi | G. Friesland | Mature | 6074.00 | 254.55 | 4.19 | 278 | |
| Salome | G. Friesland | 3 years | 8171.50 | 296.39 | 3.63 | 300 | B.S.A. Co. Mazoe Citrus Estate, Mazoe. |
| No. 22 | G. Friesland | 3 years | 6068.30 | 231.61 | 3.81 | 270 | Col. P. A. Brooke, "Borrowdale-Homestead," P.O. Box 1690, Salisbury. |
| No. 80 | G. Friesland | 3 years | 6111.60 | 230.10 | 3.77 | 300 | Brucehame Dairy, Box 21, Fort Victoria. |
| No. 23 | G. Friesland | 3 years | 7499.10 | 286.00 | 3.81 | 291 | |
| Kappie | G. Friesland | 3 years | 6244.00 | 232.39 | 3.72 | 300 | M. W. Burras, Hertford Farm, Box 443, Bulawayo. |
| Janet | G. Ayrshire | 4 years | 7273.00 | 292.08 | 4.02 | 300 | L. E. O. Cary, Clovelly, P.O. Trelawney. |
| Patches | G. Ayrshire | 3 years | 6783.50 | 254.40 | 3.75 | 300 | |
| Primula | G. Ayrshire | 4 years | 6433.50 | 235.53 | 3.66 | 300 | |
| Ruby | G. Ayrshire | Mature | 6662.00 | 241.18 | 3.62 | 286 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bella I | G. Friesland | Mature | 8803.00 | 271.91 | 3.09 | 300 | Mrs. O. L. Christo, Box 110, Gwelo. |
| Jenny | G. Friesland | 4 years | 6677.70 | 243.05 | 3.64 | 220 | Mrs R. Jackson Clarke, Kingston Dairy, Gwelo. |
| Joan | G. Friesland | 3 years | 7026.20 | 356.56 | 5.07 | 258 | |
| Midget | G. Friesland | Mature | 10359.30 | 407.94 | 3.94 | 297 | |
| Molly | G. Friesland | Mature | 6587.40 | 257.27 | 3.91 | 279 | |
| Mosquito | G. Friesland | 4 years | 9028.10 | 329.90 | 3.65 | 300 | |
| Whisky | G. Ayrshire | 3 years | 8275.60 | 305.55 | 3.69 | 300 | |
| Daisy | G. Red Poll | 3 years | 5611.90 | 235.62 | 4.20 | 261 | J. L. Cooper, Ashcroft, P.O. Fort Victoria. |
| Shamrock I | G. Friesland | 4 years | 7539.50 | 271.54 | 3.60 | 251 | T. Cousins, P.B. 20, Gwelo. |
| Blanche No. 17 | G. Friesland | Mature | 7835.00 | 242.51 | 3.10 | 300 | Cross & Son, P.B. T.208, Bulawayo. |
| Clover | G. Friesland | Mature | 7295.00 | 238.85 | 3.27 | 282 | |
| Faith No. 81 | G. Friesland | Mature | 6180.00 | 232.07 | 3.76 | 300 | |
| Lucy | G. Friesland | Mature | 9910.00 | 349.31 | 3.53 | 300 | |
| Malopo | G. Friesland | Mature | 8540.00 | 328.41 | 3.85 | 300 | |
| Mascot No. 35 | G. Friesland | Mature | 7991.00 | 286.21 | 3.58 | 259 | |
| Surprise No. 7 | G. Friesland | Mature | 11400.00 | 413.44 | 3.63 | 300 | |
| Rosette No. 36 | G. Friesland | Mature | 7086.00 | 252.32 | 3.56 | 300 | |
| May No. 50 | G. Friesland | Mature | 7034.00 | 273.20 | 3.85 | 255 | |
| Coldstream | G. Friesland | 3 years | 6060.00 | 243.33 | 4.02 | 300 | J. Cumming, Hillside Farm, P.O. Norton. |
| Blantyre | G. Friesland | 3 years | 8561.00 | 366.13 | 4.27 | 250 | J. V. Danckwerts, P.O. Box 989, Salisbury. |
| Dawn | G. Friesland | 3 years | 6525.80 | 226.38 | 3.46 | 275 | |
| Dorothy | G. Friesland | 3 years | 8934.00 | 318.02 | 3.56 | 266 | |
| Margot | G. Friesland | 3 years | 7845.00 | 286.77 | 3.66 | 300 | |
| Maureen | G. Friesland | 3 years | 6483.50 | 286.49 | 4.40 | 297 | |
| Rosa | G. Friesland | 3 years | 7002.80 | 300.49 | 4.29 | 242 | |
| Sheila | G. Friesland | 3 years | 7843.50 | 242.40 | 3.09 | 259 | |
| Vivien | G. Friesland | 3 years | 8161.80 | 278.74 | 3.41 | 239 | |
| Donkrap | G. Friesland | Mature | 5674.00 | 242.27 | 4.27 | 280 | A. B. Dobson, Endeavour Farm, Norton. |
| Hitler | G. Friesland | 4 years | 5166.60 | 253.40 | 4.90 | 300 | |
| Meeting | G. Friesland | Mature | 7754.90 | 293.22 | 3.78 | 300 | |
| Rebecca | G. Friesland | Mature | 6427.30 | 232.74 | 3.62 | 300 | |
| Spection | G. Friesland | Mature | 6719.10 | 270.62 | 4.03 | 300 | |
| Umvuma | G. Friesland | Mature | 6240.40 | 273.38 | 4.38 | 300 | |
| No. 14 | G. Friesland | 4 years | 7440.20 | 254.09 | 3.42 | 300 | J. B. Dold, Box 1153, Salisbury. |
| No. R. 184 | G. Friesland | Mature | 6250.30 | 249.44 | 3.99 | 291 | |
| No. 242 | G. Friesland | 2 years | 6323.20 | 234.66 | 3.71 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 380 | G. Guernsey | Mature | 11461.00 | 405.09 | 3.54 | 300 | B. St. J. D. Downs, Safago, P.B. Gwelo. |
| No. 400 | G. Guernsey | Mature | 7744.00 | 316.98 | 4.09 | 221 | |
| No. 464 | G. Guernsey | 4 years | 7104.00 | 280.50 | 3.95 | 298 | |
| No. 466 | G. Guernsey | 4 years | 6758.00 | 235.51 | 3.46 | 285 | |
| No. 443 | G. Guernsey | Mature | 7768.50 | 325.26 | 4.20 | 287 | |
| No. 474 | G. Guernsey | 4 years | 5262.50 | 242.27 | 4.60 | 300 | |
| Blossom | G. Friesland | Mature | 5964.46 | 235.75 | 3.95 | 274 | J. N. Duff, Box 3, Marandellas. |
| Bokkie | G. Friesland | Mature | 7068.90 | 276.98 | 3.92 | 255 | |
| Heather | G. Friesland | Mature | 6096.70 | 276.01 | 4.53 | 248 | |
| Maduba | G. Friesland | Mature | 6198.90 | 262.59 | 4.24 | 238 | |
| Blackie | G. Friesland | 4 years | 6644.50 | 266.23 | 4.01 | 300 | Mrs. D. M. Edwards, Box 11, Eiffel Flats |
| Queen Charlotte | G. Friesland | 4 years | 6924.50 | 236.76 | 3.42 | 217 | R. I. Edwards, Box 25, Chipinga. |
| Queen Mary | G. Friesland | 4 years | 9329.80 | 400.10 | 4.29 | 300 | |
| No. 275 | G. Friesland | Mature | 7306.00 | 270.07 | 3.70 | 300 | Mrs. M. Everard, Castle Zonga, Inyazura |
| No. 305 | G Friesland | Mature | 8111.00 | 316.83 | 3.91 | 300 | |
| Zonga Queen VIII | P.B. Friesland | 4 years | 6798.00 | 251.05 | 3.69 | 300 | |
| No. 206 | G. Friesland | Mature | 8661.00 | 312.98 | 3.61 | 273 | |
| No. 113 | G. Friesland | 4 years | 8501.50 | 327.80 | 3.85 | 290 | Mrs. H. C. Fischer, Olivia Farm, Headlands. |
| No. 82 | G. Friesland | Mature | 8957.00 | 298.19 | 3.33 | 277 | R. Le S. Fischer, Wakefield, P.O. Headlands. |
| No. 207 | G. Friesland | 4 years | 6212.00 | 243.10 | 3.91 | 256 | |
| No. 213 | G. Friesland | 4 years | 7129.00 | 242.95 | 3.40 | 241 | |
| No. 61 A | G. Friesland | 2 years | 5566.00 | 233.67 | 4.19 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 470 | G. Friesland | Mature | 6387.00 | 261.52 | 4.16 | 300 | |
| Gilston Virginia | G. Red Poll | Mature | 6289.00 | 236.29 | 3.76 | 300 | G. N. Fleming, Box 688, Salisbury. |
| Marzipan | G. Friesland | Mature | 7276.00 | 268.36 | 3.69 | 282 | F. W. Forrester, Wilton, Marandellas. |
| Beulah | G. Friesland | Mature | 7177.50 | 279.63 | 3.89 | 281 | G. J. Franklin & Son, Box 105, Umtali. |
| Bokkie II | G. Friesland | Mature | 8558.70 | 361.27 | 4.22 | 286 | |
| Daisy | G. Friesland | 4 years | 7941.10 | 279.89 | 3.53 | 300 | |
| Donkey | G. L.R./Shorthorn | Mature | 9687.20 | 342.48 | 3.54 | 300 | |
| Kudada | G. Friesland | Mature | 7623.10 | 277.12 | 3.64 | 300 | |

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|---|---|---|---|---|---|---|---|
| Mimi | G. Friesland | Mature | 14684.40 | 476.44 | 3.24 | 300 | G. J. Franklin & Son, Box 105, Umtali. |
| Mitzi | G. Guernsey | Mature | 5425.20 | 238.67 | 4.40 | 300 | |
| N'Dongwe | G. Friesland | Mature | 8534.80 | 370.57 | 4.34 | 300 | |
| Pipe | G. Friesland | 4 years | 8602.90 | 347.50 | 4.04 | 300 | |
| Zea | G. Friesland | Mature | 11631.70 | 441.97 | 3.79 | 300 | |
| Linda | G. Friesland | Mature | 4624.40 | 232.28 | 5.20 | 222 | |
| Maude | G. Friesland | 4 years | 9807.30 | 360.91 | 3.68 | 300 | |
| Mynhardt | G. Friesland | Mature | 7480.90 | 282.49 | 3.77 | 300 | |
| Pendek II | G. Friesland | 2 years | 6017.80 | 228.12 | 3.79 | 300 | |
| Xmas | G. Friesland | 4 years | 6874.40 | 255.99 | 3.72 | 271 | |
| No. 19 | G. Friesland | Mature | 9627.50 | 356.37 | 3.70 | 300 | P. Freeland, Lingfield, Gwelo. |
| No. 39 | G. Friesland | 2 years | 7438.00 | 271.98 | 3.66 | 299 | |
| Daffodil | G. Friesland | Mature | 10261.60 | 340.16 | 3.32 | 300 | |
| Simion | G. Friesland | Mature | 7019.50 | 259.45 | 3.70 | 300 | |
| Sophie | G. Friesland | Mature | 6894.20 | 233.72 | 3.40 | 266 | |
| Daisybelle | G. Guernsey | Mature | 6378.00 | 289.81 | 4.54 | 255 | G. G. Futter, Marjeribanks, P.O. Gwelo. |
| Nixon | G. Friesland | Mature | 5661.30 | 255.74 | 4.52 | 297 | |
| Shirley | G. Friesland | Mature | 6150.60 | 237.91 | 3.87 | 270 | |
| Beatrice | G. Friesland | Mature | 10427.00 | 329.38 | 3.16 | 300 | Hon. H. V. Gibbs, Bonisa, Redbank, Bulawayo. |
| Cloud | G. Friesland | 3 years | 6543.00 | 238.74 | 3.65 | 300 | |
| Pansy | G. Friesland | Mature | 7739.00 | 269.82 | 3.49 | 300 | |
| Poppy | G. Friesland | 3 years | 8220.00 | 286.38 | 3.48 | 300 | |
| Violet | G. Friesland | Mature | 8574.00 | 301.27 | 3.52 | 300 | |
| No. 177 | G. Friesland | Mature | 5969.40 | 242.40 | 4.06 | 300 | W. N .Gebbie, P.B. 19A. Salisbury. |
| No. 36 | G. Friesland | Mature | 8600.50 | 285.85 | 3.32 | 300 | S. Gelman, 27, Baxendale St., Bulawayo. |
| No. 35 | G. Friesland | Mature | 7775.00 | 298.51 | 3.84 | 285 | R. Gordon Kay, Box 606, Bulawayo. |
| Molly | G. Friesland | Mature | 11242.00 | 414.12 | 3.68 | 300 | Government Demonstration Farm, Umshandige, Fort Victoria. |
| Susie | G. Friesland | 4 years | 7699.00 | 276.34 | 3.59 | 300 | |
| Sweetheart | G. Friesland | 4 years | 10553.00 | 336.16 | 3.19 | 300 | |
| Lucky | G. Guernsey | 4 years | 6036.00 | 249.80 | 4.14 | 257 | |
| Violet | G. Friesland | Mature | 9030.03 | 330.08 | 3.66 | 300 | |
| Ethel | G. Guernsey | Mature | 6054.20 | 251.55 | 4.15 | 300 | D. A. Harley, Harleyton, P.O. Beatrice. |
| Myrle | G. Ayrshire | Mature | 8573.70 | 288.02 | 3.36 | 300 | |
| Biscuit | G. Guernsey | Mature | 8335.00 | 348.90 | 4.19 | 300 | D. J. Huddy, Box 718, Salisbury. |
| Frikkie | G. Friesland | Mature | 7175.00 | 252.92 | 3.52 | 262 | |
| Myrtle | G. Friesland | 3 years | 6924.00 | 235.02 | 3.39 | 257 | |
| Peggy | G. Friesland | 4 years | 6792.00 | 253.87 | 3.74 | 264 | |

## SEMI-OFFICIAL—(Continued)

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Polina | G. Friesland | 4 years | 6138.00 | 237.90 | 3.87 | 258 | L. Huddy, Box 924, Salisbury. |
| Annie | G. Guernsey | Mature | 5967.00 | 303.18 | 5.08 | 290 | Mrs. M. R. Huddy, P.O. Box 899, Salisbury |
| Queenie | G. L.R./Shorthorn | Mature | 5054.00 | 240.94 | 4.77 | 250 | |
| Mazoe | G. L.R./Shorthorn | Mature | 5173.00 | 240.41 | 4.65 | 262 | |
| Nellie | G. Friesland | Mature | 6415.00 | 241.53 | 3.77 | 270 | |
| Zambesi | G. L.R./Shorthorn | 4 years | 5655.00 | 289.33 | 5.12 | 292 | |
| Shamva | G. Friesland | Mature | 6884.30 | 264.29 | 3.83 | 300 | Sir G. M. Huggins, Box 122, Causeway, Salisbury. |
| Sue | G. Friesland | Mature | 7343.50 | 245.06 | 3.33 | 300 | |
| Columbine | G. Jersey | 3 years | 4473.00 | 244.74 | 5.47 | 300 | J. A. G. Hughes, Bains Hope, P.O. Melfort. |
| Hilda | G. Friesland | Mature | 10538.00 | 320.50 | 3.04 | 300 | |
| Jeanette | G. Friesland | Mature | 6034.00 | 227.53 | 3.77 | 295 | |
| Royal | G. Ayrshire | Mature | 8170.00 | 284.10 | 3.47 | 300 | |
| J. 11/2 | G. Friesland | Mature | 13212.00 | 400.02 | 3.03 | 300 | J. Jamieson, Box 217, Bulawayo. |
| J. 74/1 | G. Friesland | Mature | 10429.00 | 314.46 | 3.02 | 300 | |
| J. 103/1 | G. Friesland | 2 years | 9186.00 | 318.72 | 3.47 | 300 | |
| J. 183/1 | G. Friesland | Mature | 6885.00 | 238.94 | 3.47 | 248 | |
| J. 49/2 | G. Friesland | Mature | 15346.00 | 481.17 | 3.14 | 300 | |
| No. 6 | G. Friesland | 4 years | 9337.00 | 345.81 | 3.70 | 300 | D. S. Kabot, Box 261, Bulawayo. |
| No. 22 | G. Friesland | Mature | 9454.00 | 357.95 | 3.79 | 300 | |
| No. 49 | G. Friesland | Mature | 7512.00 | 237.51 | 3.16 | 300 | |
| No. 55 | G. Friesland | Mature | 12896.00 | 391.99 | 3.04 | 300 | |
| No. 79 | G. Friesland | Mature | 7845.00 | 285.66 | 3.64 | 300 | |
| No. 87 | G. Friesland | Mature | 7803.00 | 266.56 | 3.43 | 300 | |
| D.14 | G. Friesland | Mature | 9484.50 | 294.98 | 3.11 | 300 | B. H. Kew, Box 972, Bulawayo. |
| K. 6 | G. Friesland | Mature | 8598.20 | 338.14 | 3.94 | 300 | |
| K. 17 | G. Friesland | Mature | 8487.30 | 268.29 | 3.16 | 300 | |
| K. 25 | G. Friesland | Mature | 6650.70 | 242.14 | 3.66 | 300 | |
| K. 31 | G. Friesland | Mature | 6530.20 | 257.92 | 3.95 | 300 | |
| K. 51 | G. Friesland | 2 years | 6031.50 | 236.07 | 3.92 | 300 | |
| Kingston Town | G. Friesland | 4 years | 8308.00 | 287.85 | 3.47 | 300 | Kingston Farm Syndicate, Box 2, Bindura. |

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|---|---|---|---|---|---|---|---|
| Bones | G. Guernsey | Mature | 6147.00 | 301.22 | 4.90 | 269 | J. A. G. Kirstein, P.O. Box 199, Gwelo. |
| Lemoen | G. Guernsey | 4 years | 6767.00 | 297.65 | 4.40 | 276 | |
| Malettie | G. Guernsey | 4 years | 7088.00 | 303.14 | 4.28 | 281 | |
| Charmaine | G. Friesland | Mature | 6489.90 | 311.58 | 4.80 | 265 | Mrs. M. M. Krahner, Haydock Park, Banket. |
| Rosandra | G. Friesland | 3 years | 7822.50 | 268.25 | 3.43 | 300 | |
| No. 42 | G. Friesland | 3 years | 6076.40 | 232.52 | 3.83 | 272 | H. T. Lay, P.B. 107C, Salisbury. |
| Lucy | G. Friesland | 3 years | 5952.20 | 241.42 | 4.06 | 300 | D. W. Marshall, Alderbury, Box 164, Umtali. |
| Mary | G. Friesland | 4 years | 6265.40 | 263.26 | 4.20 | 300 | |
| Lorna | G. Friesland | 3 years | 6694.70 | 269.45 | 4.03 | 284 | |
| Ida | G. Friesland | Mature | 7040.10 | 254.25 | 3.44 | 300 | |
| Dale | G. Red Poll | Mature | 7281.70 | 291.31 | 4.00 | 262 | Lt.-Col. C. I. F. Maynard, Melfort, P.B 112C, Salisbury. |
| Daisy | G. Jersey | Mature | 5467.70 | 242.44 | 4.41 | 282 | |
| Makwin | G. Jersey | Mature | 6937.10 | 346.96 | 5.00 | 300 | |
| Marne | G. Jersey | 2 years | 4405.90 | 229.42 | 5.21 | 253 | |
| Noratu | G. Red Poll | 4 years | 7474.60 | 300.64 | 4.02 | 248 | |
| Gundwane | G. Friesland | Mature | 8370.00 | 338.72 | 4.05 | 300 | J. U. McCay, P.B. J181, Bulawayo. |
| Rosie | G. Friesland | Mature | 8111.00 | 277.78 | 3.42 | 300 | |
| Pooma | G. Friesland | Mature | 7136.00 | 256.98 | 3.60 | 300 | |
| No. 75 | G. Friesland | 4 years | 8082.00 | 273.65 | 3.39 | 300 | |
| No. 76 | G. Friesland | 4 years | 6960.00 | 257.56 | 3.70 | 300 | |
| No. 85 | G. Friesland | Mature | 7668.00 | 269.21 | 3.51 | 300 | |
| No. 101 | G. Friesland | Mature | 7292.00 | 268.42 | 3.68 | 300 | |
| No. 116 | G. Friesland | Mature | 7477.00 | 269.86 | 3.61 | 300 | |
| No. 128 | G. Friesland | 4 years | 7202.50 | 260.70 | 3.62 | 300 | |
| No. 129 | G. Friesland | 4 years | 7541.00 | 254.01 | 3.36 | 300 | |
| No. 151 | G. Friesland | 3 years | 6978.00 | 251.18 | 3.60 | 300 | |
| No. 153 | G. Friesland | 3 years | 7354.00 | 247.63 | 3.37 | 300 | |
| Black | G. Friesland | 4 years | 6722.70 | 242.34 | 3.60 | 300 | J. H. McLean, Box 161, Gwelo. |
| Kempie | G. Friesland | Mature | 8648.60 | 352.66 | 4.08 | 300 | |
| Tiny | G. Friesland | Mature | 7844.00 | 254.32 | 3.24 | 300 | |
| Faith | G. Friesland | 3 years | 6759.00 | 230.90 | 3.42 | 300 | L. McLean, Box 161, Gwelo. |
| Hotera | G. Friesland | Mature | 6094.00 | 226.15 | 3.71 | 232 | |
| Jessie | G. Friesland | Mature | 6939.00 | 271.61 | 3.92 | 272 | |
| Makorsi | G. Friesland | Mature | 6887.50 | 281.25 | 4.09 | 259 | |
| Ursula | G. Friesland | 3 years | 9542.50 | 325.55 | 3.41 | 300 | |
| No. 2 | G. Friesland | Mature | 10331.00 | 351.02 | 3.40 | 300 | |

**SEMI-OFFICIAL**—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| G. 30/0 | G. Friesland | Mature | 9604.00 | 309.08 | 3.22 | 300 | Meikles Trust & Invest. Co., Leachdale Farm, Shagani. |
| G. 49/4 | G. Friesland | 3 years | 5985.00 | 231.91 | 3.90 | 296 | |
| P. 50/4 | P.B. Friesland | 3 years | 8424.00 | 267.43 | 3.18 | 300 | |
| Shenzie | G. Friesland | 4 years | 7103.00 | 234.24 | 3.30 | 300 | G. H. Millar. P.B. R.157, Bulawayo. |
| Bella | G. Red Poll | Mature | 6648.00 | 259.50 | 3.90 | 300 | C. F. Mitchell. Manzana Farm, Essexvale. |
| Dawn | G. Red Poll | Mature | 6705.00 | 257.91 | 3.85 | 250 | |
| Esta | G. Red Poll | Mature | 5709.00 | 225.85 | 3.96 | 300 | |
| Queenie | G. Red Poll | Mature | 7817.00 | 263.10 | 3.37 | 300 | |
| Lesita | G. Friesland | Mature | 5531.40 | 231.01 | 4.18 | 265 | Com. E. L. Morant, Box 741, Salisbury. |
| Ursula | G. Ayrshire | 4 years | 5004.40 | 231.64 | 4.63 | 281 | |
| Violet II | G. Ayrshire | 2 years | 6765.00 | 272.77 | 4.03 | 300 | |
| Warspite | G. Ayrshire | 2 years | 5434.40 | 230.26 | 4.24 | 284 | |
| Witch | G. Ayrshire | 2 years | 5429.20 | 243.72 | 4.48 | 283 | |
| Benevento | G. Friesland | 3 years | 5721.00 | 238.84 | 4.17 | 295 | G. R. Morris, P.O. Box 1040, Salisbury. |
| Castiglione | G. Friesland | 4 years | 7954.00 | 278.21 | 3.50 | 300 | |
| Fanny | G. Friesland | Mature | 6995.00 | 230.06 | 3.29 | 300 | F. B. Morrisby, Box 36, Gwelo. |
| No. 97 | G. Friesland | Mature | 7553.00 | 263.49 | 3.49 | 300 | |
| No. 139 | G. Friesland | Mature | 6658.00 | 237.11 | 3.56 | 300 | |
| No. 154 | G. Friesland | Mature | 7194.00 | 244.27 | 3.40 | 294 | |
| Beth | G. Friesland | 4 years | 6515.00 | 250.47 | 3.84 | 289 | J. T. Mungle, Myreside, Odzi. |
| Headlands | G. Friesland | Mature | 5238.80 | 265.71 | 5.07 | 288 | |
| June | G. Friesland | Mature | 5541.70 | 247.28 | 4.46 | 276 | |
| Grace | G. Friesland | Mature | 6011.00 | 228.96 | 3.81 | 300 | Mutambara Mission, P.O. Mutambara. |
| Komitch II | G. Friesland | Mature | 7696.00 | 317.83 | 4.12 | 300 | K. Norvall, Box 637, Bulawayo. |
| Ivy | G. Friesland | Mature | 6609.00 | 245.92 | 3.72 | 287 | |
| Minhinick Patricia | P.B. Friesland | 3 years | 6656.00 | 246.99 | 3.71 | 284 | |
| Daisy II | G. Friesland | 2 years | 7963.30 | 285.58 | 3.59 | 300 | E. Palmer, Ferndale, Penhalonga. |
| Edna | G. Friesland | Mature | 9076.10 | 298.28 | 3.29 | 270 | |
| Helen | G. Friesland | Mature | 8025.10 | 302.01 | 3.84 | 248 | |
| Pixie | G. Friesland | 2 years | 7770.40 | 275.07 | 3.55 | 287 | |

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|---|---|---|---|---|---|---|---|
| Polly | G. Shorthorn | Mature | 5676.00 | 241.67 | 4.26 | 284 | |
| Shasha II | G. L.R./Shorthorn | Mature | 7032.70 | 260.43 | 3.70 | 241 | |
| Socks | G. Friesland | 4 years | 6112.40 | 261.17 | 4.27 | 226 | |
| Stella | G. L.R./Shorthorn | Mature | 8075.30 | 301.73 | 3.74 | 300 | |
| Dolly | G. Friesland | Mature | 11971.50 | 369.84 | 3.09 | 300 | Mrs. M. Parsons, P.O. Box 7, Bulawayo. |
| Elaine | G. Friesland | 3 years | 12963.00 | 407.84 | 3.15 | 300 | |
| Hasel | G. Friesland | 3 years | 9333.00 | 304.48 | 3.26 | 300 | |
| Katie | G. Friesland | 2 years | 8433.50 | 298.04 | 3.53 | 300 | |
| Lotty | G. Friesland | Mature | 11213.50 | 356.60 | 3.18 | 300 | |
| Sarah | G. Friesland | Mature | 10754.50 | 352.35 | 3.28 | 300 | |
| Stompie | G. Friesland | 2 years | 10008.00 | 338.37 | 3.38 | 300 | |
| No. 8 | G. Friesland | Mature | 7117.00 | 245.06 | 3.44 | 300 | T. C. Pascoe, Crowborough Estate, P.O. Box 1253, Salisbury. |
| Cimeron | G. Guernsey | 4 years | 6257.00 | 288.05 | 4.66 | 300 | H. J. Quinton, Rumanje, P.B. 16A, Salisbury. |
| Glen | G. Friesland | 2 years | 7262.00 | 230.64 | 3.17 | 300 | Rhod. Corp., Ltd., Kent Estate, Norton. |
| Joan | G. Friesland | Mature | 8454.00 | 339.19 | 4.01 | 296 | |
| Edward | G. Friesland | 4 years | 8762.60 | 267.14 | 3.04 | 279 | G. W. Robinson, Marimba Farm, Box 346, Salisbury. |
| Susanna | G. Friesland | 3 years | 6302.40 | 282.09 | 4.48 | 280 | Mrs. M. Rogers, P.O. Box 251, Gwelo. |
| Rebecca | G. Friesland | Mature | 6628.60 | 239.13 | 3.61 | 300 | Mrs. D. M. Rutherford, Igava, P.O. Marandellas. |
| Tippett | G. Friesland | Mature | 6208.40 | 239.74 | 3.86 | 277 | |
| Illovo | G. Friesland | 2 years | 7472.80 | 280.90 | 3.75 | 300 | W. F. H. Scutt, Maple Leaf, Norton. |
| James | G. Friesland | 4 years | 8903.40 | 330.78 | 3.71 | 300 | |
| Juta | G. Friesland | 2 years | 7744.20 | 263.76 | 3.41 | 300 | |
| Langis | G. Friesland | Mature | 7818.80 | 298.19 | 3.81 | 300 | |
| Sandiford | G. Friesland | 2 years | 7328.50 | 254.08 | 3.46 | 300 | |
| Sunflower | G. Friesland | 2 years | 7335.30 | 249.01 | 3.39 | 300 | |
| Bontrok | G. Ayrshire | Mature | 5755.90 | 265.77 | 4.62 | 259 | S. M. Sinclair, Albany, P.B. Melsetter. |
| Stella | G. Ayrshire | Mature | 5852.20 | 247.05 | 4.22 | 269 | |
| Battle Faith | P.B. Ayrshire | 3 years | 5544.00 | 234.02 | 4.22 | 300 | J. R. Stewart & Sons, Ltd., Battle Farm, P.O. Shangani. |
| Battle Fame | P.B. Ayrshire | Mature | 6879.00 | 299.80 | 4.36 | 300 | |
| G. 1 | G. Ayrshire | Mature | 7901.00 | 307.09 | 3.89 | 287 | |
| G. 11 | G. Ayrshire | Mature | 6031.00 | 233.34 | 3.87 | 272 | |
| G. 17 | G. Ayrshire | Mature | 7393.00 | 293.37 | 3.97 | 300 | |
| G. 40 | G. Ayrshire | 2 years | 5519.00 | 234.66 | 4.25 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Dinah II | G. Red Poll | Mature | 6032.90 | 262.55 | 4.35 | 300 | H. Stobart. Atlanta, Arcturus. |
| No. 40 | G. Friesland | Mature | 9147.60 | 297.42 | 3.25 | 287 | H. Swaine, Box 131, Gwelo. |
| Gushure | G. Friesland | Mature | 11841.00 | 414.93 | 3.50 | 300 | E. Tapson Trust, Ltd., Lesapi Falls, Rusape. |
| Bantu | G. Friesland | Mature | 5168.50 | 242.15 | 4.69 | 253 | L. Taylor, Box 55, Selukwe. |
| Chrome Mine | G. Friesland | Mature | 5900.00 | 242.45 | 4.11 | 263 | |
| Gwelo | G. Friesland | Mature | 7504.70 | 258.64 | 3.45 | 300 | |
| Home Farm | G. Friesland | Mature | 8331.10 | 404.27 | 4.85 | 300 | |
| Joeburg | G. Friesland | Mature | 8460.90 | 344.12 | 4.07 | 300 | |
| Kafela | G. Friesland | Mature | 6064.90 | 258.62 | 4.26 | 291 | |
| Nyumbe | G. Red Poll | Mature | 6194.40 | 261.69 | 4.22 | 300 | |
| Steamer | G. Friesland | Mature | 5905.90 | 230.46 | 3.92 | 225 | |
| Tiger | G. Friesland | Mature | 5310.40 | 257.10 | 4.84 | 258 | |
| No. 28 | G. Friesland | 4 years | 5614.10 | 235.30 | 4.19 | 232 | A. W. Tennent, Kelvin, Headlands. |
| Bindura II | G. Red Poll | Mature | 6377.60 | 238.54 | 3.74 | 300 | J. G. Thurlow, Atherstone, Bindura. |
| Betty | G. Friesland | Mature | 8001.50 | 265.65 | 3.32 | 289 | Mrs. M. Turnbull, Box 479, Bulawayo. |
| Cowslip | G. Friesland | 2 years | 8317.10 | 305.26 | 3.67 | 300 | |
| Gloria | G. Friesland | 3 years | 8336.30 | 288.38 | 3.46 | 300 | |
| Patches | G. Friesland | 4 years | 7808.00 | 240.43 | 3.08 | 286 | |
| Rosie II | G. Friesland | Mature | 6453.00 | 233.80 | 3.62 | 300 | A. F. H. Valentine, Battery Spruit, Umtali. |
| Beans | G. Friesland | Mature | 7149.20 | 287.79 | 4.02 | 270 | G. Valentine, Achnashee, Odzi. |
| White | G. Guernsey | 3 years | 4820.30 | 238.62 | 4.91 | 286 | |
| Mary III | G. Friesland | Mature | 6392.00 | 250.07 | 3.97 | 300 | Miss I. E. van Niekerk, Claremont, P.B. Rusape. |
| Verna | G. Friesland | Mature | 8063.00 | 305.81 | 3.79 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Agnes | G. Friesland | 3 years | 7775.00 | 285.65 | 3.67 | 300 | R. O. Waldschutz, Mere Farm, Box 27, Marandellas. |
| Commeche III | G. Friesland | Mature | 8508.00 | 285.21 | 3.35 | 300 | |
| June | G. Friesland | 3 years | 6644.00 | 251.81 | 3.79 | 270 | |
| Maria | G. Friesland | 3 years | 8050.00 | 259.12 | 3.22 | 300 | |
| Meggie II | G. Friesland | Mature | 7508.00 | 312.39 | 4.18 | 259 | |
| Mussolina | G. Friesland | Mature | 7090.00 | 258.14 | 3.64 | 285 | |
| Sheila | G. Friesland | Mature | 6261.00 | 252.34 | 4.03 | 237 | |
| Teenie | G. Friesland | 3 years | 6082.00 | 226.33 | 3.72 | 300 | |
| Buttercup II | G. South Devon | Mature | 6974.00 | 293.61 | 4.21 | 300 | N. W. Whitehead, Lonsdale Farm, P.O. Matopos. |
| Dot | G. Friesland | 2 years | 9194.80 | 317.56 | 3.45 | 300 | |
| Ivy | G. Friesland | 3 years | 8272.10 | 308.16 | 3.70 | 300 | |
| Orange | G. Friesland | 4 years | 8899.20 | 318.67 | 3.58 | 291 | |
| Pam | G. Friesland | 3 years | 8360.20 | 288.57 | 3.46 | 300 | |
| Pat | G. Friesland | 3 years | 7416.80 | 242.27 | 3.27 | 286 | |
| Dorothy | G. Friesland | 2 years | 6344.00 | 264.68 | 4.17 | 300 | A. Young, Dundrennan, Box 509, Sinoia. |

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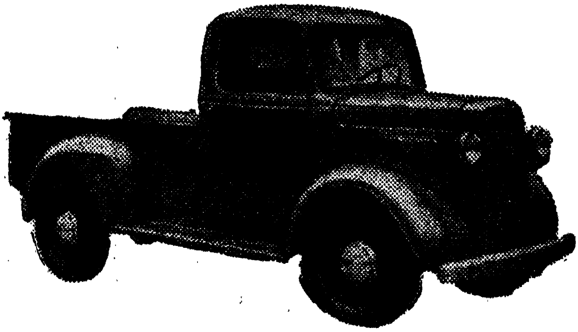

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# THE RHODESIA
# Agricultural Journal

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# Editorial

## Notes and Comments

### EXTRACTS FROM ROTHAMSTED EXPERIMENTAL STATION ANNUAL REPORT FOR 1948.

The above comprehensive report has now been published and is obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Hertfordshire, at 5s. (foreign postage extra).

An Introduction is given by the Director, Dr. W. G. Ogg, and this is followed by reports from each Department, including results of the field experiments at Woburn Experimental Farm and Rothamsted Farm. A Report on the Survey of England and Wales is included as well as a special review on the work of the Serological Reactions of Plant Viruses. A List of Departmental Publications is given at the end and also a map of Rothamsted Farm.

The series of deep ploughing experiments started in 1944 were continued. None of the outside experiments on potatoes showed any benefit from deep ploughing, but on plots of the six-course experiment where potash was put in the bouts the average yield of potatoes increased from 15 tons to 18 tons per acre. It is still too early to give an opinion on the statistical significance of the results.

Earthing up of potatoes had no bearing on the total yield or on the yield of saleable ware, but a straw mulch resulted in a statistically significant increase of yield of ware by 1¼ ton per acre.

In co-operation with the Forestry Commission Research Branch, work continued on conifer seedlings in various nurseries in 1948.

In the Botany Section water culture experiments were carried out on the trace elements with particular reference to Molybdenum.

The data from the botanical analyses of Hay from the Park Grass Plots are now being written up.

Research on viruses included studies on the Tobacco Necrosis Virus, Potato and Sugar Beet Virus and Lettuce Mosaic.

The Soil Survey of England and Wales, which came under the administration of Lewes Agricultural Trust in October, 1946, was continued. The report shows the progress achieved in mapping the soils of the various districts from October, 1946, to December, 1948.

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## POISONOUS PLANTS OF THE MARANDELLAS DISTRICT

In this issue coloured blocks appear in the above article. This is the first time that coloured blocks have been produced in Southern Rhodesia. For the cost of these blocks on Poisonous Plants thanks are due to the South Marandellas Farmers Association, who under Capt. W. F. Collins have worked extremely hard to produce the results. It is an article which, it is felt, is sure to be greatly appreciated by the farming community in particular.

# Some Notes on Freshwater Fishes in Southern Rhodesia

## PART III

By R. A. JUBB, B.Sc.

Whilst trawling off the coast near East London in December, 1938, a fishing boat captured a strange fish which proved to be a living Coelacanth, a type of fish believed by Biologists to have become extinct some 70 million years ago. As yet, nothing as exciting as this has been discovered in our rivers, but, nevetheless, fishes whose direct ancestry dates back as far are taken from the Central African Lakes and from the lower Zambesi. These African " Lung-fishes " of archaic times have adapted themselves to use lungs instead of gills for breathing, and are able to survive in mud; they should therefore find some of our rivers quite inhabitable!

Coming down the evolution scale we find the *Mormyridae*, a family of strange and ancient fish peculiar to Africa, and considered to have been here some time before the more modern stream-line models of the *Order Ostariophysi* which includes Tiger-fish, Yellow-fish, Silver-fish and their kin.

Numerous species of the family *Mormyridae* have survived, and are found in most rivers and lakes in Central Africa. During the rainy season one hears and reads about the catches of " Bottle-nose " and " Cornish Jack "; these fish appear to be fairly common in the larger tributaries of the Zambesi. Not so common, but often the cause of much discussion, we find a small species of the same family which has a long name—*Gnathonemus macrolepidotus*, a cousin, so to speak, of the " Bottle-nose." This fish is known to some anglers as " Bull-dog."—probably due to the shape of its face. Specimens have been caught as near to Salisbury as in the Cleveland Dam.

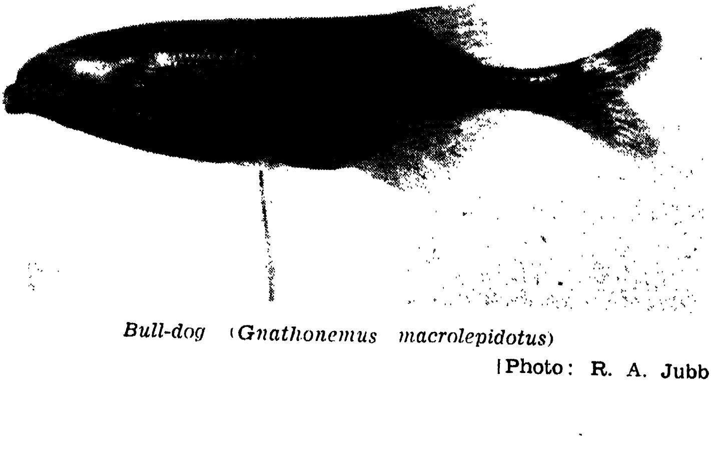
The photographs help to illustrate the remarkable differences between this primitive type of fish and a more modern species of the family *Cyprinidae* which belongs to the *Order Ostariophysi.*

*Gnathonemus macrolepidotus* (Bull dog). A small fish which rarely exceeds 12 inches in length, which is found in the Zambesi River System. In colour it is slatey-grey, with light head and d blotches on body. The fish takes worm bait, but is usually caught by accident, and not angled for. Like most of the *Mormyridae* the flesh, when cooked, is said to be rich. The fish inhabits deep pools and slow running water. For identification purposes note the prominent chin, the small scales and the small, forked tail; it is obviously not an athletic type and is a weak swimmer.

*Barilius neavii* (Banded minnow), belongs to the family *Cyprinidae*, a pretty little fish with its silvery sides, dark bluish vertical bars, pinkish sheen on gill covers, and scarlet edging to front of dorsal fin and fork of tail. In length it rarely exceeds seven inches. From an angling point of view this is a pity as it frequents rapidly running water, and, caught on a cotton line with worm bait, it puts up a game fight. This fish would be a colourful addition to a large aerated aquarium. For identification purposes the markings are characteristic. Note the deeply forked tail, with distance between points of lobes slightly greater than depth of fish, and the lack of an adipose fin and barbels. Found in most of the tributaries of the Zambesi River.

*Banded Minnow* (*Barilius neavii*)

[Photo: R. A. Jubb



*Bull-dog* (*Gnathonemus macrolepidotus*)

[Photo: R. A. Jubb

# Small Irrigation Schemes

## Instructions for taking Soil Samples

Office of the Chief Chemist, Department of Agriculture

Most of the small irrigation schemes in this country are sited where they are, because of the availability of water, and not because of the suitability of the soil. As a result, in all too many cases, soils which are not really suitable are being irrigated. In a very short time their productivity will decline, and expensive methods of reclamation, including in some cases the installation of drains, will become necessary. One of the first requirements, therefore, when deciding on an irrigation scheme is to ensure that the soil can be safely irrigated.

This will depend mainly upon whether there is good natural drainage downwards through the soil body. Laboratory analysis of soil samples only reveals some of the factors affecting drainage. Information gained by examination of the soil in its natural state in the walls of a specially dug pit is of equal, or even greater importance. The purpose of these notes is to explain how this may be done.

**How and Where to Dig the Pits.** The area which can be commanded by irrigation water should first be examined for surface indications of changes in soil type. These may be shown by changes in soil colour or natural vegetation. In cultivated lands experience gained in working the soil often suggests where changes occur. Soil type is likely to be different in areas which receive more than the normal amount of natural drainage water; such areas may be revealed by the slope, by the darker soil colours, or by changes in the type and growth of grasses in the case of virgin land.

Having decided where changes take place, at least one pit should be sunk in each type. If a large area of apparently uniform type occurs, pits should be sunk at intervals of 250 yards. If these pits reveal significant variations, intermediate pits will be necessary.

To be of any use, pits must be **at least 6 feet deep.** The most convenient type of pit has been found to be a rectangular one, 6 feet long by 3 feet wide. The sides should be vertical, and all spoil must be thrown completely to one end, so that a clean cut is obtained, uncontaminated by spoil.

**What to Look for in the Pits.** The pit should preferably have been allowed to dry out for at least a day before examination. First clean the face furthest removed from the spoil-heap with a spade. Then observe and record the following:

1. The depth at which soil finally ceases.

2. Whether layers of gravel or stones occur in the soil. Note the depth at which they begin and end, whether they are mixed with soil or not, whether roots penetrate and whether the particles or stones are tightly or loosely packed.

3. The depths at which changes occur in:

   (a) Colour. Look particularly for marked darkening, yellowing or mottling.

   (b) Soil Type. Note obvious changes in sandiness or clayeyness.

   (c) Compaction. Note whether the soil becomes noticeably harder or softer at any point, or whether anything resembling a plough-pan occurs.

   (d) Cracking. If the pit has had time to dry out, note whether cracks occur, whether they are more pronounced vertically or horizontally, or whether they form a pattern like miniature "crazy pavement."

   (e) Moisture. Marked changes in moisture when the pit has had time to dry out may be highly significant.

4. The nature of the material below the true soil. If this is rock, note whether it is decomposed or not, whether it crumbles readily, breaks with difficulty or not at all. If it consists of gravel or stones, note the point suggested in (2) above.

5. Whether the pit is in cultivated, fallow or virgin land. If in, or near virgin land, note the type of vegetation; whether it is heavily or sparsely wooded, whether grass cover is good. If possible, give the names of the dominant tree types.

**Other Necessary Information.** Some idea of the approximate relationship of the pits to each other, and to the topography of the area is necessary for their proper interpretation. This can be shown by a rough sketch map indicating the approximate position of the pits and any stream-beds or natural drainage channels and depressions. The general slope of the land should be shown by arrows, with marginal notes as to whether gradients are flat, gentle, or steep. The approximate scale of the sketch, or the area represented by it, should be indicated.

If the land has been cultivated, full details of its past history should be given, as well as the crops which it is intended to grow under irrigation. Also state the source of irrigation water (see below).

**Sampling.** It is not necessary or desirable to take samples from every pit. Should several pits appear closely similar choose one of them for sampling.

Make sure that the face of the pit to be sampled is " clean " and then take the following samples:

(a) One from the lowest soil layer.

(b) One from one of the middle soil layers.

(c) One from the top 6 inches.

About 2 lbs. is the ideal amount to take. In choosing the layer from which to take sample (b) discretion must be used. For instance if one of the middle soil layers is obviously different from the others, particularly if it appears to contain free lime, or if it is hard and compacted, sample (b) should be taken from this layer rather than from the exact middle depth of the soil.

If a non-soil layer is thought to contain a large amount of lime, it is advisable to submit a sample of it in addition to the three soil samples.

Samples must be placed in clean bags and labelled with the name of the farm and owner, the number of the pit and the depth at which the sample was taken.

**The Water Supply.** Most river waters are suitable for irrigation, but underground waters often contain salts which may be harmful. If, therefore, the irrigation water is to be obtained from deep wells, boreholes or old mine-shafts it is necessary to submit a sample for analysis. At least 2 pints is required. The bottle in which the sample is sent should be clean and be rinsed several times with the water to be tested.

Samples of soil and water must be sent, carriage paid, to the Chief Chemist, Department of Agriculture, P.O. Box 25, Causeway Salisbury, and must be accompanied by a description of all pits dug, and the other information described above.

**It cannot be over-emphasised that the correct assessment of the suitability of an area for irrigation depends upon the completeness and accuracy of the pit descriptions as much as upon the analysis of soil samples, if not more.**

# The Red-Billed Quelea

## A Problem for Grain-Sorghum Growers

By D. C. H. PLOWES, Matopos Research Station

Increasing interest in the growing of grain sorghums as a cash crop in Matabeleland focuses attention on the possible depredations of birds to this crop, and calls for a resumé of what little is known of the habits and economics of the chief offender, the Red-billed Quelea (*Quelea quelea lathamii*). No doubt most other members of the Weaver or Finch family do take grain on occasion, but their numbers are generally small, and it is unlikely that they will ever constitute a serious hazard to the production of small grains in the drier area of the Colony.

As the name implies, the chief feature of this bird is the pinky red bill, which is of a more or less uniform colour at all seasons. The birds are a drab brown at all times, except for a period in the summer, when the males don their breeding dress. This results in an alteration to the colour of the face, which then becomes black (though occasionally this is absent), and is surrounded by varying amounts of pink, or sometimes yellow. In winter the males, as well as females, are only to be distinguished (except by the expert) by the red bill, and the manner of congregating in large flocks, from other birds of the same group.

These birds are normally resident in thornveld areas, and occur throughout the Bushveld of South Africa. In the winter, large swarms, totalling many thousands of birds each, invade the Highveld of the Transvaal, and feed into the Eastern Cape Province, and have been known to breed there. Such extensions of their normal range are probably attributable to climatic factors, but no work has been done on these lines.

In recent years, the presence of large breeding swarms in the Western Transvaal has excited attention in the Press; this area is similar to much of Matabeleland from the agricultural point of view, and kaffircorn is likewise one of the chief crops there.

In the past, farmers living near the Vaal River have had their crops so ravaged by these birds that they had given up the planting of Kaffircorn. (Those farmers further away from the river, were generally unaffected, as Queleas like to roost and nest in trees.) The birds had been virtually absent from this area for a few seasons, so that on many farms the planting of sorghums was recommenced.

*Red-bill Quelea nest. Made of coarse woven grass*
[Photo: D. C. H. Plowes

*Red-bill Quelea nests*
*These birds were alleged to have done enormous damage to the grain crops of the Western Transvaal*
[Photo: D. C. H. Plowes

*Red-bill Quelea nests along the Vaal River*
*Part of one of several huge colonies that nested here in January,* 1948
[Photo: D. C. H. Plowes

***Part of a vast colony of Red-billed Quelea nests in thick bush along the Vaal River The nests were used in January-February. Over* 350 *are discernible in this tree***
[Photo: D. C. H. Plowes

The Queleas established themselves in the thorn thickets along the Vaal River, and from there ranged out onto the adjacent lands. If newspaper reports are to be believed, the birds frequently accounted for 100 per cent. of the crop. Enraged farmers tried every device to get rid of the unwelcome pests—large sums were spent on shotgun ammunition, but hardly any impression was made on the ranks of the enemy. Someone suggested that flame-throwers be used on the nests at night, but there was a big outcry against this alleged cruelty. A visit was paid by the author to one of the breeding colonies, near Bloemhof, just after the chicks had left. This colony covered about 1,000 acres, and it was estimated that it must have contained about 1,000,000 nests. As there are an average of three chicks per nest, as well as the two parents, there must have been about 5,000,000 birds in this one colony alone! These birds are normally very noisy, and persons who walked through the colony whilst it was still inhabited say that the din was absolutely deafening, and left one's ears tingling for quite some time afterwards.

The trees in this area were all small, being typical *Acacia karroo* thicket, and contained from 5 to 50 nests per bush. In an adjacent colony, where the accompanying illustrations were taken, there were as many as 500 nests in the larger trees. The nests are woven of grass, and are pear-shaped, and the three pale blue eggs are laid from mid-January onwards. In each colony, all the activities are synchronised, and the birds are more or less at the same stage in the nesting-cycle all the time. A colony is therefore occupied for about 6 weeks only. It is possible that the same birds may breed twice in an especially favourable year, as one colony was reported to have been re-occupied about a month after the first lot of chicks had flown.

At Matopos, Queleas are present all the year round, except for a while from early February to late March, when they leave to nest. At present, their nesting sites are not known, and anyone having any knowledge of them, is asked to communicate with the author.

Great difficulty is at present being experienced here in keeping the birds off the valuable experimental plots, and native umfaans are used to drive the birds away as soon as they appear. The proportion of damage done by a flock of birds is much greater in a small plot than in a large area of land. Herein lies one of the main hopes for the future of small grain crops in Matabeleland. With a certain population of destructive birds, the percentage sustained by farmers decreases as the acreage planted is increased.

It is possible though, that when large acreages are planted to sorghums and sunflowers (these also being readily taken), that birds will be attracted to the area, or that due to the increased food supply, more chicks will be reared each year. These points require further investigation—particularly the latter, for it is possible that the chicks are fed on insects, and not on grain.

As mentioned earlier, knowledge of the economics of these birds is very limited. We know that they are destructive to crops such as kaffircorn, sunflower and wheat, during that period of the year when these are available (viz. from mid-Feb. to mid-April), but what of the other ten months in the year? Is it not possible that they are then living on insects and weed seeds and thereby more than nullify the damage they do to crops. These are factors to be borne in mind before any wholesale extermination of the species is mooted, for the balance of Nature is generally very precarious and easily upset. Present knowledge would indicate though, that no great loss would be suffered if these birds were to be greatly reduced in numbers. In a series of 20 birds examined by the author in mid-winter, no trace of insects could be found in the stomachs—the contents appeared to consist solely of weed and grass seeds.

Because they are absent, for the purposes of breeding, from defined localities, for periods of about two months each year, damage could probably be minimised by planting such varieties as will pass their most vulnerable period during the absence of the Queleas. Certain of the dwarf sorghums now under trial at Matopos, are early maturing, and fit well within this period in most years. All the small-grain crops become liable to attack as soon as the seed begins to form, until such time as it is finally reaped, and it is during this time that the crops are in need of protection.

Bird-proof kaffircorn has been developed in the Union, but has not met with much success, largely because of the poor price it commands. In this variety, the seeds are bitter, and they are furthermore protected by the bracts and hairs, which are longer than in the normal varieties Apparently, in the absence of more desirable types, birds will tackle these strains as well. That their sense of taste is fairly well developed, is borne out by observations made by Mr. T. K. Sansom, for many years the wheat breeder at the Salisbury Experimental Station. In large fields containing numerous small plots of different varieties of wheat under trial and selection, the birds made unerringly for those types having a high protein content. Also, it was observed that birds preferred the beardless to the bearded types of wheat, the grains being more accessible in the former.

The protection of crops by mechanical and other devices has enjoyed many years of study overseas. The results may be summed up by saying that almost any device is usually effective for a little while, until the birds become accustomed to it, and cease to associate it with danger.

A popular method of bird-scaring in South Africa, where small fields are concerned, is to have strings stretched out from one central pole to outlying poles, and to have tin cans, etc., tied to them. A violent pull at the centre then sets the whole network rattling.

For bigger areas, native youths can be armed with whips, to crack in the air whenever swarms appear. This requires to be supplemented by occasionally firing into the flocks with a shotgun. In America, mechanical bird-scarers, activated by acetylene, are available, and these can be regulated to explode at varying intervals. Here again, one needs to loose off a few rounds of fine shot into the swarms from time to time, in order that the birds do not forget that a loud report is to be associated with a gun.

The encouragement of hawks will serve the two-fold purpose of keeping both birds and rats away. It has been suggested that hawks might be specially bred and trained for the job, as in England, but for various reasons, it is doubted that this would prove very efficaceous out here.

The destruction of nesting colonies by flame-throwers or other means would serve as a check on the further increase of the birds. The adults themselves are not likely to be affected by night attacks, such as was suggested for combatting the Western Transvaal swarms, as they would almost certainly leave the nests on being disturbed. If it becomes necessary to limit the increase of the Quelea population, then the most satisfactory way would probably be to destroy the nests while they contain eggs—this would minimise suffering, and if done over a period of years, would actually cause a decrease in the numbers of Queleas, as there would be no replacement for natural losses.

Around Bloemhof, it was hoped to drive away the swarms by destroying the nesting colonies, but even if that were possible, it would only mean that they would be driven onto someone else's lands.

Poisoning of the Queleas by strychnine has often been advocated, but the writer is doubtful that this would prove effective. At the time that the grain is in seed, it is unlikely that the Queleas will do much feeding off the ground, so that the spreading of poisoned bait is more likely to kill useful or ornamental birds instead.

Although the text of this article may appear somewhat pessimistic, the position is as yet not acute in Matabeleland, as the birds do not appear to be very common, and anyone attempting the cultivation of small-grain crops on a large scale is unlikely to lose more than but a few per cent. There is however, urgent need for research into this subject, in order that informed opinion will be available should it ever be necessary to take active steps against the Red-billed Quelea here.

# Mosaic "Scorch" in Tobacco

By J. C. F. HOPKINS, D.Sc. (Lond.), A.I.C.T.A.,
Chief Botanist and Plant Pathologist

## SUMMARY

"Scorching" or "burning" of the lower leaves of tobacco has been prevalent during the last three years of drought and investigations have shown that this injury is confined to tobacco plants infected with the mosaic virus. Uninfected plants growing under identical conditions do not "scorch" severely, neither do plants growing under conditions of adequate rainfall.

"Scorching" is produced in apparently healthy plants when infection is set up at time of topping, although no mottling of the leaves is apparent. Later, these plants develop mottling of the very young leaves and suckers; patterns, elsewhere attributed to several different virus strains, appearing on different leaves of the same plant.

Measures for the control of mosaic should be vigorously applied from the time of preparation of seed-beds up to and including topping.

The past three years have afforded an apportunity for the study of the development of mosaic disease of tobacco in the field under exceptional conditions of drought. Many crops have had to endure rainless periods of six weeks or more, with air temperatures well above normal for the time of year. Under these conditions a great deal of "scorching" or "burning" of the lower leaves has occurred, and losses in some instances have been high from plants infected by the mosaic virus.

This type of mosaic "scorch" or "burn" has been reported in the past (1) (2), and is well known by experienced growers, but the intensity and wide distribution of this manifestation of mosaic has been so pronounced this year that a further note on the disease is not out of place.

**Description.** The symptoms of the disease are to be seen on the middle and lower leaves; usually the bottom three or four leaves are unaffected (Fig. 1). First of all some of the smaller veins turn yellow, and the colour gradually extends into the web of the leaf. Very soon minute dark spots develop on the veins, and in the yellow areas, running together to form

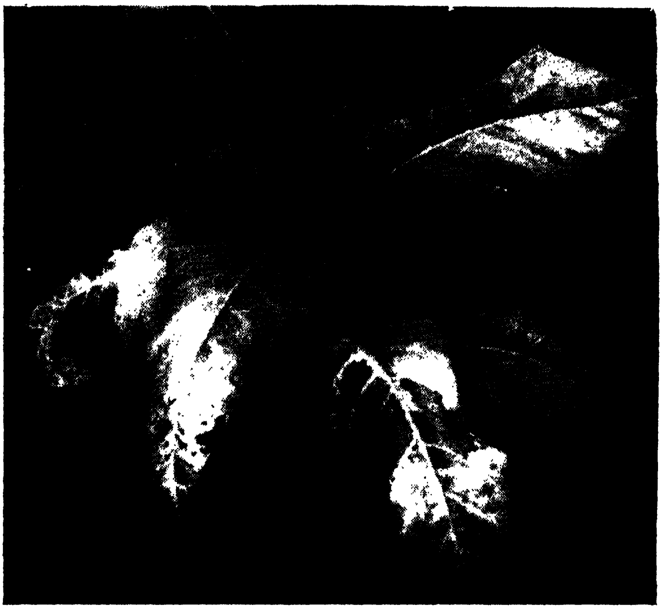


Fig. 1. *Hopkins, Tobacco Mosaic*

Fig. 2. *Hopkins, Tobacco Mosaic*

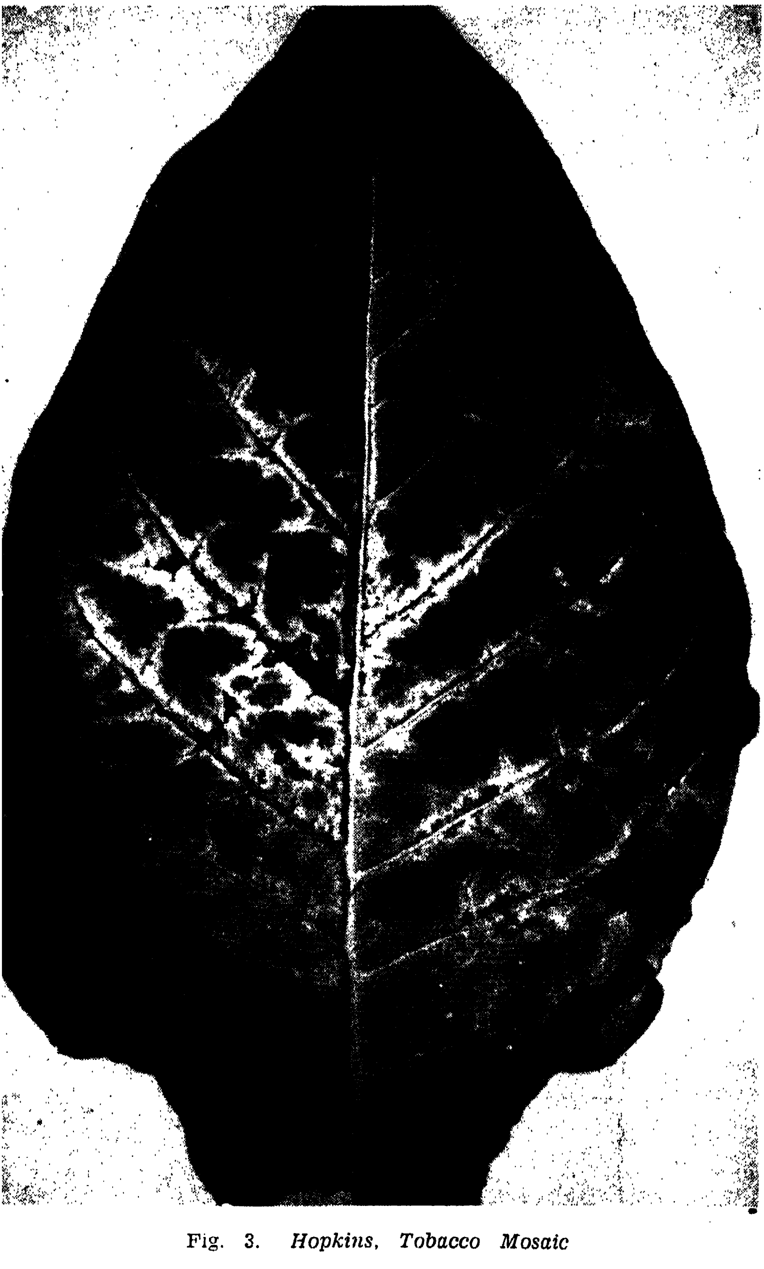


Fig. 3. *Hopkins, Tobacco Mosaic*

lines or "streaks" (Fig. 3). These spots then increase in numbers, and the yellowing extends to cover a large area of the leaf. Finally the yellow areas dry out, and turn reddish-brown, in which the original spots may often be discerned because of their lighter colour (Fig. 1). Less severely affected leaves may ripen but develop spotting during curing, and the final product appears as shown in Fig. 2.

**Cause.** Most growers are familiar with the "scorching" which develops on the lower leaves of tobacco plants showing the ordinary light and dark green mottling caused by the mosaic virus. Many, however, have not associated the scorching of lower leaves, which develops on apparently healthy plants, with this virus, and have attributed the damage solely to scorching by the sun during a period of drought.

But healthy plants do not "scorch" in this manner, and observations have shown that every injured plant was affected by the mosaic virus. Mottling was often present only in the very youngest leaves or in the suckers after topping, so that with the slow growth which occurs during drought, much damage to the lower leaves was caused before the sucker leaves grew sufficiently for the mottling to be apparent. The virus was present although the plants appeared to be healthy.

Tobacco uninfected by mosaic growing under identical conditions in the same lands as affected plants, and often next to them, exhibited no signs at all of this kind of injury. Nor did severe "scorching" occur on mosaic-infected plants growing in nearby lands where rain had fallen and normal growth had been maintained. These observations are in conformity with others made over a long period of years, so that it is reasonable to conclude that the disease was due to a combination of mosaic infection and drought.

That a wide variation in symptoms may be caused by the same strain of mosaic virus under differing environmental conditions has been questioned by some virus workers, who would rather attribute each set of symptoms to a different strain. But although it is known that a number of different strains of a virus may occur, and it is reasonable to expect a variation in the reaction of the same variety of tobacco to each strain, yet it is also known that environmental factors such a temperaure, light intensity and soil fertility also produce marked variations in the symptoms produced by one virus.

In the course of the investigations made during the past few seasons, single tobacco plants have been seen to exhibit on different leaves symptoms variously attributed to viruses causing the following diseases: severe mosaic type 1; severe mosaic type 2; mild mosaic type 1; and mosaic burn.

One explanation is that variations in environment actually change the nature of the virus in the plant, even to the extent of allowing the plant to recover completely. But knowledge of the nature of viruses and their reactions to environment is as yet so elementary that attempted explanations are of little value here. What is important, however, is a consideration of the practical implications involved.

All growers know, or have heard of, the losses in weight and quality of leaf which follow infection by the mosaic virus in seed beds, at transplanting and at priming, and it has been the custom to ignore the consequences of infection set up at time of topping. But much of the " scorching " described here was due to invasion of the plant by the mosaic virus during topping, so that when rainfall is erratic and periods of drought may be expected, not only must care be exercised in the degree to which topping is carried out, but the usual precautions should be taken to check the spread of mosaic through the crop.

Here again is shown the importance of taking every care in the early stages to prevent mosaic infection so as to reduce to a minimum the subsequent build up. Even a few mosaic plants in a land soon after planting are a serious source of danger, and they should be looked for and rogued as soon as they are recognisable.

There has been a tendency in recent years towards a slackening of the measures for the control of mosaic, and this is reflected in the poor quality of a good deal of leaf produced. One important way to improve the quality of the crop is for all growers to tighten up on mosaic control. The measures which have been advocated for many years are highly effective if practised thoroughly.

**Control.** The control of mosaic depends essentially on preventing sap from an infected plant being brought into contact with healthy plants. The principal method of spread is, of course, by handling, so that practical control boils down to:

(1) Prevention of contamination of the hands with material containing the mosaic virus.

(2) Frequent washing of the hands to remove accidental contamination.

In Rhodesia the principal source of contamination is native snuff, which is made from leaf invariably infected by mosaic. Smoking and chewing tobaccos are also lively sources of infection. The virus is capable of maintaining its infectivity for many years in dried tobacco leaf, having been reported in U.S.A. to remain active for as long as 52 years. (2.)

The first precaution, therefore, is to choose as far as possible only non-smokers and non-snuffers for jobs which involve much handling of the plants, i.e., seed-beds, planting out and priming. If this is not possible, then every effort must be made to prevent smoking and snuffing whilst work is in progress.

It has been proved in practice that seed-beds which are handled much always produce a lot of mosaic plants, therefore care should be taken in the preparation of the beds to destroy all weeds before sowing, and to sow the correct amount of seed so that thinning becomes unnecessary. If the beds must be handled, the boys should wash their hands thoroughly and frequently with soap and water, or soap and a disinfectant. The hands should not be just dipped into the disinfectant; the liquid should be poured over the hands which should be well cleansed with soap. The object is to remove the gummy sap which contains the virus.

If these precautions are taken and only healthy plants are raised there is still a possibility of a few mosaic plants appearing in the lands, because it is known that the mosaic virus can be carried over from season to season in the soil. As it is not possible to guard against this entirely, a close inspection should be made of the crop about a month after planting, and mosaic plants pulled out before there is any chance of their being handled. This is much safer than putting separate boys on to deal with infected plants. When planting out, and again during priming and topping, soap and buckets of disinfectant should be provided so that hands can be washed at the end of each row, thereby reducing to a minimum the spread of any virus which may have been overlooked.

If it is clearly understood that the mosaic virus is highly infectious, that it is present in all smoking tobacco and snuff, that it is transferred to healthy plants by handling, and can cause a reduction of crop in weight alone of as much as forty per cent., then there will be no need to stress further the importance of the precautions outlined above.

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# Poisonous Plants of the Marandellas District

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(With a note on *Diplodia* Poisoning
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## PREFACE

The Marandellas area, source of four important rivers, the Sabi, the Umfuli, the Hunyani, and the Mazoe, with a rainfall of 30-35", is considered to be one of the best stock-raising districts in Southern Rhodesia. Its flora is that of the Rhodesian high veld, and, because flowering is confined mainly to a three or four-month rainy season, collection of specimens and identification are difficult. Its floral variety is considerable, and compares favourably with that of other countries in which altitude tempers the heat of a tropical geography.

The vegetation of the district, like most of Rhodesia, is of the savannah type, i.e., open woodland with tall grasses beneath and between the trees. The dominant trees, as always at these altitudes in Mashonaland, are the Msasa (*Brachystegia spiciformis*) and the Mnondo (*Isoberlinia globiflora*), but with a large number of other woody species accompanying them.

The altitude is from 5,446 ft., that of the Township of Marandellas, to about 4,500 ft., and the conditions provide a fair cross-section of the flora of that part of Southern Rhodesia which is believed to be healthiest for residence of the white race.

After some years of raising cattle on an undeveloped farm of this district, the first author became convinced that certain occasional deaths among his stock could be attributed to plant-poisoning, rather than to disease. Information as to the existence of poisonous plants in the district was meagre, and, while all local farmers agreed that losses from plant-poisoning were low, some maintained that, in fact, they were having no such losses. A small collection of specimens similar to poisonous plants figured in South African farming literature was then made, and some were identified by the Branch of Botany of the Southern Rhodesian Department of Agriculture as being identical with others known to be poisonous in South Africa. The South Marandellas Farmers' Association was informed of the position, and the writer then offered prizes in a competition organised by the Association, for the best collection of poisonous plants from the district. The response, greatly assisted by identification of all specimens by the Branch of Botany, was such that the Association decided to hold a second competition. It is perhaps worth recording that a winning collection in this second competition was made from plants all found within an area of 160 acres only. Finance was also raised by the Association for the illustration of a number of the poisonous plants found and finally for a part in the publication and illustration of this Bulletin.

The Branch of Botany and Plant Pathology has carried the matter further by adding to the collection, by the scientific classification and description of the plants and by assisting in publication.

Special thanks of the Association are due to Mrs. Dehn, an artist resident in the district, who, in addition to providing the illustrations and assisting in the work of reproducing them, has been active in the collection of nearly all the plants illustrated. Furthermore, she was awarded first prize in the second plant-collecting competition. The Veterinary Department, though understaffed, and with no equipment comparable to that which has placed Onderstepoort in the front rank of the world's veterinary research, has assisted in making tests.

Of few plants only can the botanist say "The leaves, roots, flowers and fruit of this plant are a deadly poison." In very many cases, plants are suspect because they, or closely allied species, have been proved to be toxic in other countries. How dangerous they are in Rhodesia or whether the Rhodesian veld is more safe for livestock than that of South Africa are questions which must be left to time and research to decide.

We have to thank the South African Department of Agriculture for a complete series of reprints from "Farming in South Africa" on the subject of plant-poisoning in general.

Stent (1931), has listed, but without description, the poisonous plants of Southern Rhodesia known at that time. The Marandellas collections include many of these plants, also a number of those listed in Brain's "The Weeds and Poisonous Plants of Southern Rhodesia" (1934, Nov.), and "Trees and Wild Flowers on the Rhodesia Farm" (1934, Jan.).

Certain plants may be poisonous and dangerous in one area and innocuous in another. Consequently the evidence against most of the plants described in this Bulletin is circumstantial rather than direct. Fortunately for the district, its suspect plants, though of considerable number and variety are widely spread and seldom occur in concentrations such as to infest any grazing area. The list of suspect plants, once negligible in number, has now assumed somewhat formidable proportions and provides a considerable field for those interested in the toxicological side of veterinary research.

Lest too much weight be attached to botanical evidence, let it be mentioned that in the case of one only, the blue "tulp" or "tulip," *Moraea zambesiaca*, has a local plant been convicted by actual test, of poisoning cattle in the district. A yellow "tulp" whose flowering period is short, has so far evaded collection, but is stated by reliable farmers to have killed many cattle in years of exceptional drought.

It is not possible, as yet, to secure any exact picture as to what proportion of untimely deaths of cattle in this area is due to plant-poisoning. It is now clear, however, that the presence of a not inconsiderable number of plants, some certainly poisonous and others suspect, provides plenty of opportunity for losses from this cause. Accidents in dipping continue, so the veterinarians assure us, to be by far the most serious poison menace.

But, whatever the cause of death, the farmer is legally responsible for a reasonable competence in determining its cause. Each January he is required by law to render a return of the previous year's losses of stock under the heads of "Disease," "Veld-Poisoning," "Poverty and Old Age," "Accident," etc. Veld-poisoning, of which plant-poisoning is certainly the major part, is therefore officially recognised as one of the main causes of the loss of livestock in the Colony. Even so, not all losses of stock are caught in the statistical net. Mortality under the semi-ranching conditions of the district, is apt to be highest among the calves. Such losses, especially in the Reserves, may easily escape the Statistician. Abortion, too, which is fairly common even among seemingly healthy cattle may sometimes be due to poisoning. Many plants containing severe gastro-intestinal irritants cause expulsion of the foetus

**Conditions giving rise to Plant-Poisoning of Cattle.** Some farmers are of opinion that animals have some sort of sixth sense which warns them against the eating of poisonous plants and a further gift by which they warn their young against this same danger. Nevertheless, it is common experience in England that horses, cattle and sheep continue to die from eating, for instance, the leaves and fruit of the Yew. Similarly, no sixth sense appears capable of warning livestock against "tulip" poisoning, which causes many deaths in the Union of South Africa, and it is obvious that livestock must be unable to warn their young against danger of which they themselves are unaware.

The farmer, however, can do much to protect his stock by bearing in mind the special conditions which are apt to give rise to poisoning. They are summed up by Steyn (1934), as follows:

A. Under drought conditions, animals, in the absence of edible vegetation, or when such vegetation is scanty, are forced to feed on poisonous plants.

B. In winter and in early spring before the summer rains have fallen, animals are attracted by the green leaves and flowers of poisonous non-deciduous trees and shrubs and by other poisonous plants, which, having deep roots or bulbs, are not dependent upon spring rains for the production of leaves and flowers.

C. It happens frequently that animals are unable to avoid eating poisonous plants when these grow in close association with grass.

D. Plant poisoning is very frequent in the case of transport and draught animals, as these hungry animals, when outspanned, will greedily eat any plant.

E. Animals imported from overseas or animals introduced into new areas often fall easy victims to poisonous plants, as, not being familiar with the vegetation, they are unable to exercise their sense of discrimination.

F. Poisonous plants may be eaten accidentally in hay.

G. Want of phosphorus causes a craving for substances which animals, in normal circumstances, would not eat.

H. Animals may acquire a craving for certain poisonous plants, and other animals follow their example. In the United States, animals are said to develop a craving for *Cucumis myriocarpus;* common on old mealie lands in Rhodesia, and sudden outbreaks of poisoning have been attributed to this cause.

I. By overstocking, the veld is denuded of edible vegetation, and the stock are left with the choice of starvation or involuntary suicide by the eating of poisonous plants. The valuable edible plants are continuously eaten and may eventually disappear while the poisonous plants are left to grow, seed and spread rapidly.

Under normal Rhodesian conditions, growth of many poisonous plants as well as of the grasses, is restricted through the long dry season. With the modern trend towards water-conservation and the building of numerous dams, overstocking cannot fail to extend the period over which poisonous plants increase at the expense of the edible. Near certain Rhodesian dams, for instance, the Horsetail (*Equisetum ramosissimum*), Buttercup (*Ranunculus pubescens*), Gentian (*Chironia transvaalensis*), *Solanum spp.* (Bitter apples and deadly nightshade), flourish through a long period of the year. Hungry animals admitted to such areas are apt to overfeed, and become subject to bloating (hoven), whose symptoms may well conceal those of poisonous plants in course of digestion.

Fowls and game-birds are by no means free from the risk of plant-poisoning. In England, pheasants have been known to die from Yew poisoning when there was no shortage of palatable food. Cases of pheasant-poisoning from Ivy-berries have been recorded on several occasions.

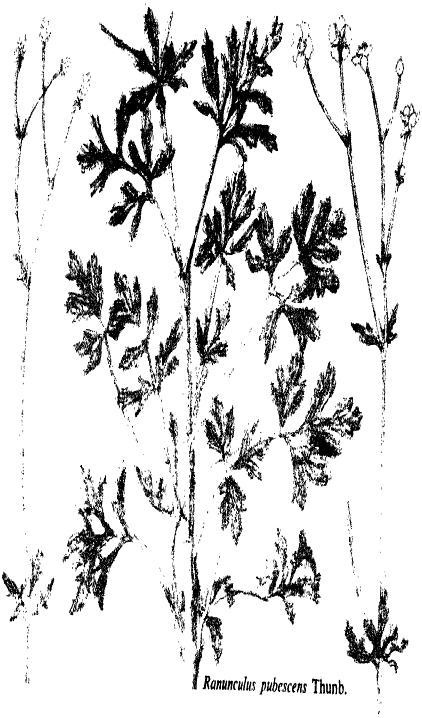
Nutritious grasses normally eaten by cattle may, under certain conditions, be poisonous. *Cynodon dactylon* (kweek or couch), one of our most valuable grasses, is very poisonous when wilted, owing to the liberation of dangerous amounts of hydrocyanic acid. Similarly, kaffir corn and even young maize-stalks may be poisonous when frosted or wilted. Further, it is known that stockfeeds themselves, such as lucerne, which may contain up to .056 per cent. of hydrocyanic acid, rhubarb and beetroot leaves, which may contain an excessive amount of oxalates, linseed, and even cottonseed, if fed in excessive quantities may be toxic. Quantities of a plant which are poisonous to one species of animal may not affect another. Syringa (*Melia azedarach*) berries, for instance, are poisonous to pigs, but not to cattle. Castor beans (*Ricinus communis*) are twenty times more dangerous to horses than to cattle.

Steyn (1934), sums the position: "There seems little doubt that the actions of the different poisons are exerted in different manners, and that these actions depend upon a large number of factors about which we know very little at the present time." Some plants may cause death almost instantaneously (those containing prussic acid), whilst others exert their actions only after a period of "incubation." Thus, in cases of *Senecio* and Bracken poisoning, the animals may die months after having eaten these plants. The poison appears to be cumulative and to have what may be described as a "trigger" action, that is, distress appears with a rush, and the animals may die within a few hours of appearance of the symptoms.

**Plants Dangerous to Children.** To the list of conditions giving rise to poisoning may be added the natural inquisitiveness and indeed, voracity of the young, and the readiness with which newcomers import and plant poisonous exotic trees and flowers round their homesteads, giving thought to decoration and old association rather than to the danger they are bringing to their children. The extreme toxicity of the Oleander (*Nerium oleander*) is mentioned in the text. The China berry or Syringa (*Melia azedarach*) commonly planted near homesteads, yields berries which have poisoned children in this country. *Datura stramonium*, the Thornapple or Stinkbloom, is also an introduced species. "Ingestion of the seeds, sometimes in large amount, by young children frequently leads to a fatal issue." Beyers (ex Steyn, 1934), states that the sucking of nectar from the "flowers produces a mild degree of poisoning in children." The Bushman's bush (*Acokanthera venenata*), interesting and decorative flowering shrub, whose juice was commonly used by the Bushmen and Hottentots as an arrow poison, has a plum-like fruit, and has frequently been recorded as the cause of poisoning in both man and animals.

*Thevetia neriifolia*, though exceedingly poisonous, is growing in some of our school grounds (Brain, April, 1934).

The Castor Oil plant, a weed common in neglected gardens, is decorative but dangerous. Castor oil is one of the most

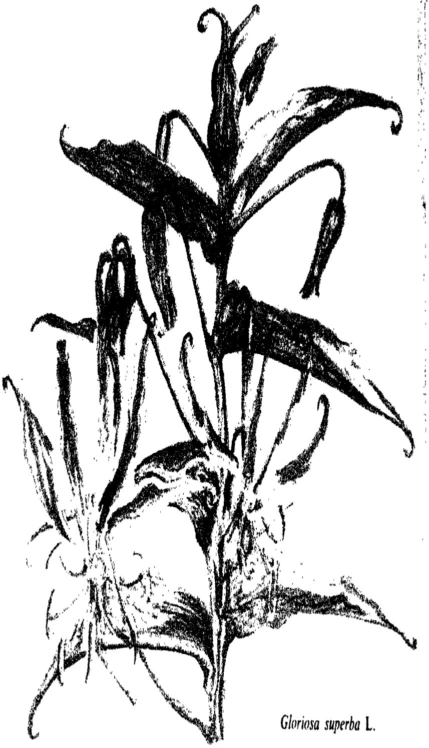


*Ranunculus pubescens* Thunb.

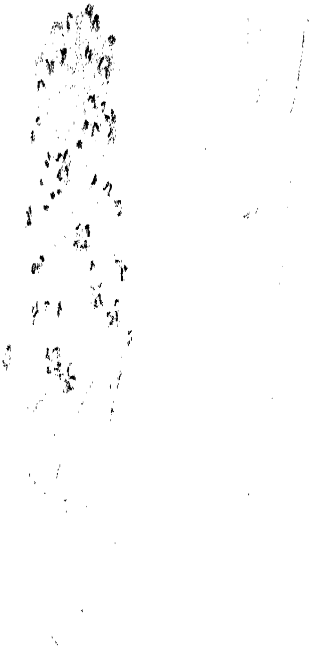
*Nerium oleander* L.

*Senecio latifolius* DC.

*Cucumis africanus* L.f.

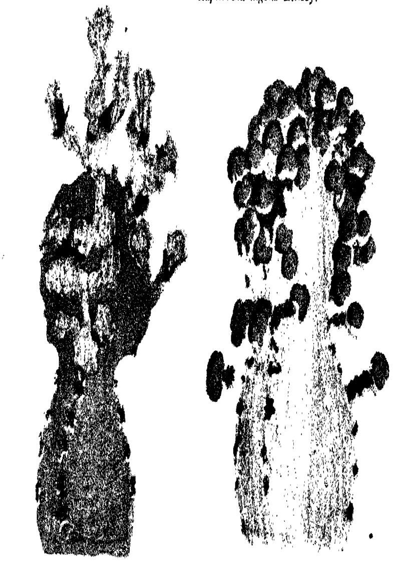


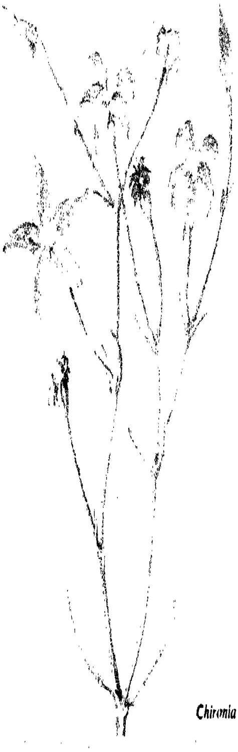
Gloriosa superba L.



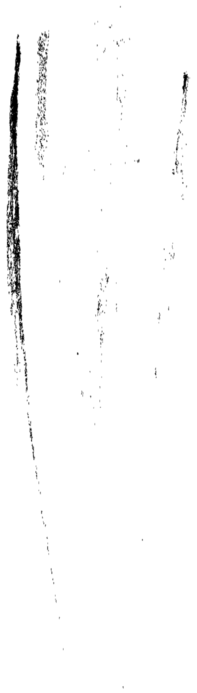
Kalanchoe thyrsiflora Harv.

Euphorbia ingens E.Mey.





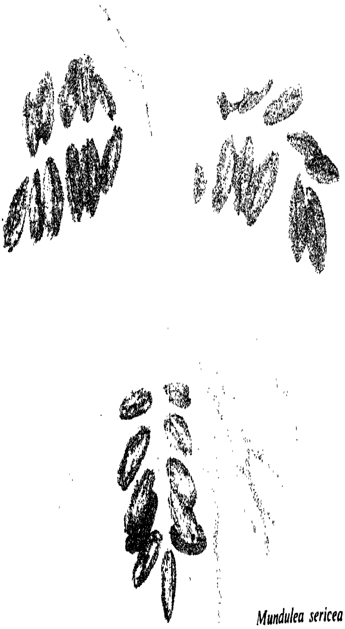
Chironia transvaalensis Gilg.



*Moraea zambesiaca* Bak.

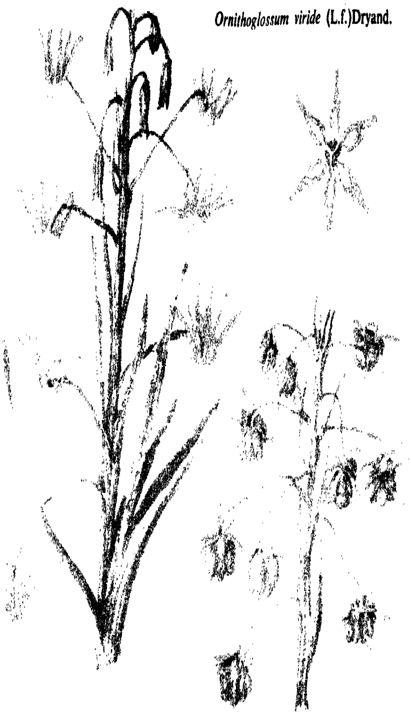
*Datura tatula* L.

*Solanum incanum* L.

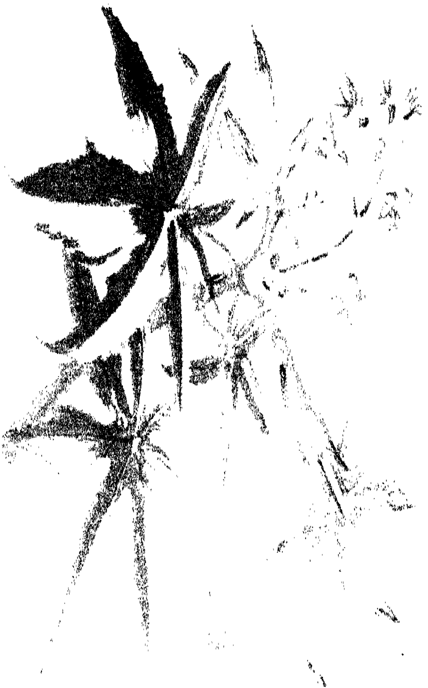


*Mundulea sericea* A.Chev.

**PLATE 4**

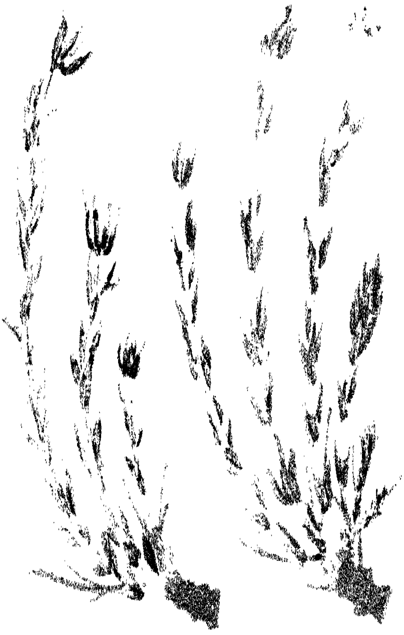


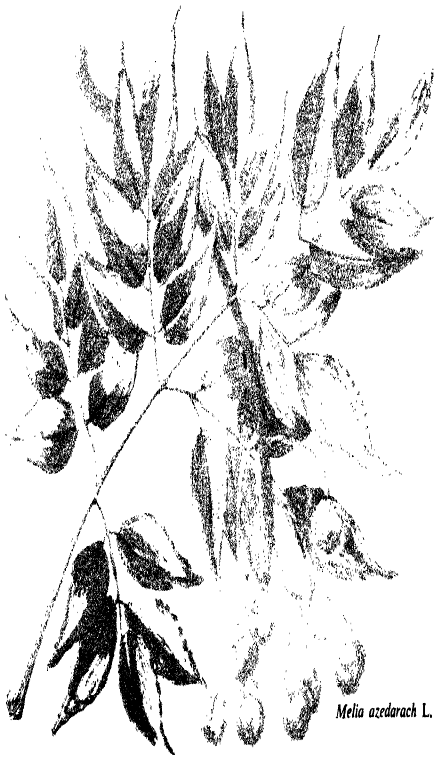
*Ornithoglossum viride* (L.f.)Dryand.



*Ricinus communis* L.

*Lasiosiphon kraussianus* (Meisn.)Meisn.

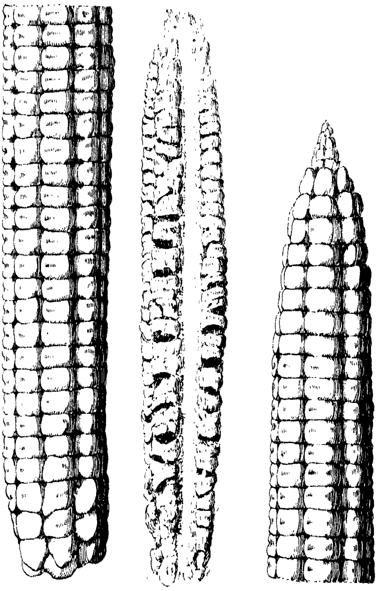




*Melia azedarach* L.

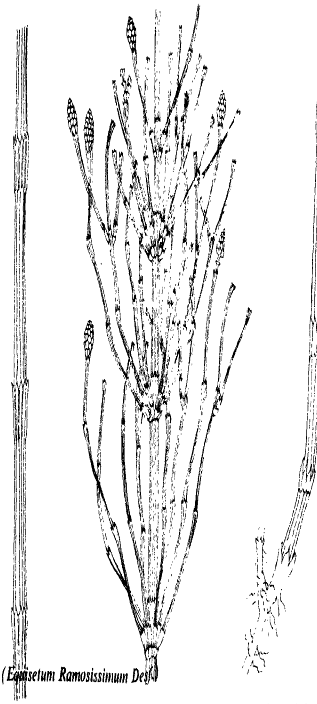
**PLATE 5**

*Bracken Fern*



*Diplodia*

*Sarcostemma viminale* R.Br.



*Horsetail (Equisetum Ramosissinum Desf.)*

commonly used mild purgatives, and has little attraction, it may be contended, to the most inquisitive of children. But danger is there, and the seed itself occasionally contaminates mealies, beans, etc., threshed near the plants, resulting in serious mortality. It is exceeding poisonous to man, to horses, cattle, sheep and geese. "Even a single seed causes alarming symptoms in human beings, and two seeds have caused death in an adult." (Glaister, ex Steyn, 1934).

**Fish Poisons.** From time immemorial the capture of fish by means of poisons from the roots of plants such as *Dolichos buchanani*, or their fruits, for instance of *Tephrosia Vogelii* (Fish bean of Northern Rhodesia), has been one of the main duties of African women, and to this practice is possibly due the poverty of fish in many of the streams in Mashonaland. The practice has been prohibited under the Game and Fish Preservation Act and Regulations (1942), Act 15, which reads: "No person shall . . . . by means of any chemical, poisonous, intoxicating or other injurious substance, wilfully kill . . . . any fish in any water." Numerous farmers are endeavouring to increase the supply of fish in dams and streams and are likely to be subjected to poaching by means of fish poisons. A special note has therefore been made against all specimens believed to be in use for this purpose.

**Mushrooms.** A list of local poisonous plants cannot be complete without reference to mushrooms. Wild mushrooms of several varieties are much relished by natives, and two or three kinds are commonly eaten by Europeans. Neither white man nor black is in agreement as to what variety, if any, relished by his opposite number, is poisonous. In the Union, only three varieties: *Amanita pantherina* (Panther agaric), *A. muscaria* (Fly agaric), and *A. phalloides* (Death cup, Toadstool), are well known to be poisonous. None of them has been recorded from Rhodesia. Let it not be thought, from this fact, that there is no risk of mushroom-poisoning in Rhodesia. In Europe, mushrooms found in woods or growing in the vicinity of trees and hedges are always suspect. Though it is believed that the injurious constituents of many poisonous fungi pass off in the process of cooking, this is not so in the case of *Amanita bhuroides*, the Blackcap, a variety found in Europe. It is stated that "one fifth of a grain (of bhurine) would be fatal to an adult, in other words, a single fungus in the dish might poison three people."

In ancient times, so we read, poisoning was a fine art and to be poisoned was considered just at natural as contracting a disease. The progress of science and public opinion has changed all this. But on the veld and on our farms, it is still just as natural for our livestock to die of poisoning as from disease. Let us hope that a closer study of poisonous plants will, in the future, cause poison-deaths among livestock to become both as uncommon and as unnatural as they are now, among civilised humans.

W. F. COLLINS.

# SELECTED POISONOUS PLANTS FROM THE MARANDELLAS DISTRICT

The plants described in the following pages were chosen as being common in the Marandellas district. All of them naturally occur also in other parts of Rhodesia, and may be more or less common than they are in this district. In consequence this paper is not of interest solely to Marandellas farmers, although it would not be very representative of the poisonous plants of the lowveld and parts of Matabeleland. A certain amount of selectivity has also had to be exercised since all the illustrations have been made from living plants growing in the district, and the necessary flowering specimens have not always been readily available to the artist.

Finally, in the descriptions, an attempt has been made to make them as simple as possible whilst describing adequately the distinctive characters of the plants. Technical terms could not be avoided completely, so a short glossary is given at the end of this article.

As the diagnosis and treatment of poisoning are a purely veterinary matter, and as neither of the present authors is at all qualified in this respect, this facet of the subject is not dealt with here.

### *RANUNCULUS PUBESCENS Thunb.* (*RANUNCULACEAE*)

Plate 1.

**Common Name.** Buttercup.

**Description.** A 2-3′ branching herb, with hairy stems and leaves. Radicle leaves on long petioles, pinnately or bipinnately dissected with wedge-shaped segments, crenate at the apex. The stem leaves become less dissected towards the inflorescence, and have progressively shorter petiols. The flowers are yellow and in a loose terminal panicle, cup-shaped, ⅓-½″ in diameter, and with reflexed sepals. The typical buttercup appearance of the plant is not easily mistaken.

**Occurrence.** Common, but confined to stream sides and damp places. Often associated with *Chiroria transvaalensis* Gilg. Flowers during the rainy season.

**Poisonous Properties.** The poisonous principle is not known, and the toxicity of the plant is probably variable with locality and time of year, although information on this point is scanty, it has been proved poisonous to sheep, and is likely to be so to other animals. Stock should be herded away from streamsides and vleis, where this plant occurs, particularly in droughts.—Steyn, 1934).

*NERIUM OLEANDER L.* (*APOCYNACEAE*)

Plate 1.

**Common Name.** Oleander.

**Description.** A glabrous shrub, 10-12′ high with a milky latex. Leaves green, narrow, oblong, lanceolate, usually in whorls of three, leathery, and transversely feather-veined. Flowers very showy in terminal cymes 1½-3″ across, salver-shaped, and usually pink or white in colour. Some varieties have double flowers. Fruit of two follicles, with numerous hairy, twisted seeds.

**Occurrence.** A shrub of Mediterranean and Asiatic origin commonly cultivated as an ornamental throughout Rhodesia.

**Poisonous Properties.** The leaves, flowers and branches are all poisonous, and contain a poisonous principle known as oleandrin, which has a digitalis-like action, i.e., it affects the heart. Human beings and animals are equally susceptible. (Steyn, 1934).

*SENECIO LATIFOLIUS DC.* (*COMPOSITAE*)

Plate 1.

**Common Names.** Ragwort, Senecio.

**Description.** A perennial with clustered, cylindrical roots and the base of the stems woolly. Sends up annual, unbranched stems to a height of about 3′ in spring. The number of stems is variable, but usually one to three. The stems are leafy with alternate, oblong, acute, smooth, grey-green leaves. Except occasionally for the basal ones, the sessile leaf bases are auricled or eared, and clasp the stem. The leaf margins are usually minutely toothed or denticulate. The midstem leaves are from 2-3″ long and up to ½″wide. Towards both the apex and base of the stem the leaves tend to decrease in size. The inflorescence is a corymb of many small, yellow-flowered heads. Each head is up to ⅓″ long and ⅛″ wide, has four or five yellow rays and about twelve tubular disc florets. The glabrous achenes or fruits bear a copious white pappus.

The plant described here, which is common throughout Mashonaland, is one of a complex of forms or varieties which go to make up the broad species *Senecio latifolius* DC. These forms have at one time or another been given specific rank, but the authorities at Kew are at present very chary of splitting this complex into distinct species. Our plant most nearly conforms to one of these forms someties designated as *Senecio retrorsus* DC., whilst the Eastern District *Senecio* of this complex is also separated by some botanists as *Senecio sceleratus* Schweickerdt. The toxicity, however, of the individual members of this complex is only a matter of degree, so from a poisonous plant point of view the nomenclature of our Mashonaland plant is not of great importance.

**Occurrence.** The plant is a common constituent of savannah woodland in Mashonaland, and flowers from September to December. The annual stems begin to appear in spring, and their growth is stimulated by the veld burning at this time.

**Poisonous Properties.** The poisonous principle is of an alkaloidal nature, and whilst most animals react to it, horses are the most susceptible. The effect is of a chronic nature and feeding trials have shown that the plant may be eaten for from one to two months before death ensues in cattle or horses (Steyn, 1934). This means that a considerable density of the plant is necessary for it to be dangerous, and in addition, Rhodesian observations show that the plant is rarely grazed. In times of prolonged drought, however, it might constitute a danger.

### *CUCUMIS AFRICANUS L.f.* (*CUCURBITACEAE*)

Plate 1.

**Common Name.** Wild Cucumber.

**Description.** A creeping annual which is seabrous everywhere, i.e., has a sandpapery feel. The branches are angular and creep for several feet. The leaves are alternate, and have tendrils in their axils, are petiolate and usually three, sometimes five, lobed, the central lobe being the longest. The lobes themselves may be entire or slightly lobed and coarsely toothed. The whole leaf is about 2″ long and 1-1½″ wide. The male flowers are very small, yellow, and clustered on a slender peduncle up to ¾″ long. The female flowers are on longer, stouter peduncles on the same plant. The fruit is ovoid, about 1½″ long and ¾-1″ broad, yellow when ripe, and bearing on its surface sharp spines about ⅛″ long. The seeds are many, pale in colour, oblong and flattish.

**Occurrence.** Common in cultivated land, fallows or disturbed land. The characteristic fruits are readily seen in mid-rainy season.

**Poisonous Properties.** The poisonous principle is cucumin, and it is the fruit which is the dangerous part of the plant. Human beings and all kinds of stock are susceptible to poisoning. When a sufficient quantity of the fruit is eaten death is very rapid—Steyn, (1934).

*GLORIOSA SUPERBA L.* (*LILIACEAE*)
Plate 2.

**Common Names.** Flame Lily. Nyakajongwe (Manyika); Nyan L'enkuku (Sindebele).

**Description.** A perennial growing from a tuberous root which sends up a single erect or half-climbing stem to about 3′. The stem bears alternate or sometimes opposite sessile clasping leaves which are from 3-6″ long, and terminate in a short curling tendril. The stems sometimes have a tendency to scramble, and the tendrils may then clasp other plants. The flowers are large and rise in the axils of the upper leaves, usually not exceeding four per stem. They may be a bright red, or contain varying portions of yellow also. The perianth segments are characteristically reflexed and arch inwards over the back of the flower, whilst the anthers are placed horizontally, and the style is abruptly bent at right angles to the ovary. The fruit is a three-valved capsule with many seeds.

**Occurrence.** Common throughout Rhodesia except in the lowveld, but favours granite kopjes or may often be found intermingled with the branches of low-growing shrubs. Flowers in the mid-rainy season.

**Poisonous Properties.** This plant is probably not very dangerous to cattle as it is the root which contains the poisonous principle, colchicine, and although this is harmful to all warm-blooded animals, the roots are not very likely to be eaten by them. Cases of human poisoning however; probably mostly natives, are not unknown.—(Steyn, 1934).

*KALANCHOE THYRSIFLORA Harv.* (*CRASSULACEAE*)
Plate 2.

**Common Name.** White Lady.

**Description.** A perennial, which, in the pre-flowering stage, can be recognised by its large orbicular basal leaves at ground level, which are more or less vertical, and in one plane. The stout flowering stem of about 2′ arises from between these at the end of the rainy season and flowers between May and September. The flowering stem bears opposite sessile, very obtuse, thick leaves, about 2″ long, or rather more. The inflorescence is very dense and terminal, being made up of short stalked cymes combined into an obling panicle or thyrse from 6-12″ long. The individual flowers are pale yellow or orange, and scented, but the most characteristic feature of the plant is the fine white mealy powder which is especially obvious on the inflorescence, but is also to be found on the leaves and stems. It rubs off very easily and thins out to some extent on the leaves with age when they become more obviously a glaucous green with pink edges.

**Occurrence.** This plant is fairly common, but is restricted almost entirely to granite kopjes.

**Poisonous Properties.** The inflorescences of this plant were proved to be poisonous to sheep by Steyn and Van der Walt (1941). About 1½ lbs. were sufficient to cause death in 7½ hours.

*EUPHORBIA INGENS* E. Mey (*EUPHORBIACEAE*)

Plate 2.

**Common Names.** Candelabra Euphorbia. mKonde (Chishona). Um Hlonhlo (Sindebele).

**Description.** A tree of 20-30′ with leafless succulent dark green branches which curve upwards and terminate at the same general level. The branches which bear flowers terminally are 4-7 angled, and are constricted into 3-6″ segments. The angles are wing-like and bear short spines which soon fall off. The flowers are clustered on the edges of the wings in the top foot or so of the branches, and are of the characteristic Euphorbia type. The fruits are globose, somewhat fleshy capsules rather less than ½″ in diameter, and pinkish when mature. All parts contain an abundant milky latex.

**Occurrence.** On the high veld this tree is confined to granite kopjes and termite mounds, and is consequently scattered in its distribution. In the low veld areas of Rhodesia, however, such as the Sabi and Zambesi valleys, it is often a fairly important constituent of Acacia-Mopane-Baobab woodland, although it still seems to display a preference for termite mounds.

**Poisonous Properties.** The latex of this tree is strongly irritant, and causes blistering of the skin and mucous membranes. If cattle are driven through dense bush containing this tree they may suffer severe eye burn, and severe burning on facial skin (Steyn, 1941).

Owing to the distribution of this tree it is not likely to constitute a serious menace to cattle in the high veld, although human beings should beware of it. It is likely to be dangerous to cattle, however, in parts of the low veld.

*CHIRONIA TRANSVAALENSIS* Gilg (*GENTIANACEAE*)

Plate 2.

**Common Name.** Rhodesian Wild Gentian.

**Description.** A herb, about 2′ tall, with a basal rosette of radical leaves, which are 1-2″ long and ⅓″ wide or less. The stem bears about five pairs of widely-spaced, opposite, linear, or linear-lanceolate leaves, from 1-3″ long and up to ¼″ wide.

The inflorescence is a lax cyme of pink flowers each about 1″ in diameter. The anthers are bright yellow, about ¼″ long and straight, or very slightly twisted.

**Occurrence.** Very commonly found along stream banks and in vleis. The pink flowers make an attractive show in the rainy season, when this plant is in flower.

**Poisonous Properties.** This plant has been proved toxic (Steyn, 1934), to sheep and rabbits, about one pound being sufficient to kill a sheep in 30 hours. Because of its liking for streamsides it is most likely to be troublesome when the veld is droughted and animals tend to graze in these places. It often grows in association with a very closely related plant *Chironia humilis* Gilg, distinguished by its flowers being a light magenta rather than pink, and having anthers with a marked spiral twist. This latter has not been proved poisonous, but may quite likely be so.

## *MORAEA ZAMBESIACA* Bak. (*IRIDACEAE*)

Plate 3.

**Common Names.** Zambesi tulp. This word "tulp" is a corruption of the word "tulip." It is used in Southern Africa to denote plants which are, in reality, more nearly allied to the garden Iris.

**Description.** A perennial plant growing from an underground corm up to 1″ in diameter. Several corms are often clustered together, and each produces one narrow leaf up to 18″ long and ½″ wide. The flowering stem is unbranched, about 18″ long and invested with usually two rudimentary sheathing leaves. One flower at a time appears from the apex of the stem and between the sheathing leaves. When this first flower has withered, a second usually follows on. These flowers are about 2″ across, blue-mauve in colour, and easily recognisable as they resemble those of the garden iris. The fruit is a brown cylindrical capsule about 1″ long and ¼″ wide, with many seeds.

**Occurrence.** A fairly common plant occurring in colonies along stream banks and in vleis, though not in the wettest parts.

**Poisonous Properties.** This tulp flowers in September-October, and it is at this time when it is most poisonous to stock. Cattle do not eat it readily, but will do so when hungry or unaccustomed to the plant, due to having been moved from an area where it does not occur. There is also a danger when its leaves appear before the grasses. When fed in hay the dried leaves are equally dangerous, four or five ounces of the plant being sufficient to kill a beast in 24 hours. (Stent and Lawrence, 1932).

*DATURA TATULA L.* (*SOLANACEAE*)
Plate 3.

**Common Names.** Purple Thornapple, Purple Stramonium.

**Description.** A bushy annual herb up to 5′. Leaves alternate, petioled with a blade up to 5″ long and almost equally broad, ovate or ovate-lanceolate and coarsely lobed, glabrous. The flowers are solitary, trumpet-shaped, with the lobes ending in fine points, up to 3½″ long and pale mauve in colour. Fruit, a spiny capsule becoming woody when ripe. About 1½″ long and rather less in diameter and with pubesecent spines up to ⅜″ long. The seeds are many, about ⅛″ long, lentil-shaped, finely reticulated and blackish.

**Occurrence.** An introduced weed common around buildings and in cultivated or waste land.

**Poisonous Properties.** The active principles of this plant are stated to be atropine, hyoscyamine and hyoscine, all of which are highly poisonous. The seeds are especially so, and cases are reported of children being affected by poisoning after sucking nectar from the flowers. Both animals and humans are susceptible to poisoning by this plant (Steyn, 1934). Finally, two other closely related plants, the white stramonium or stinkblaar (*Datura stramonium* L.) and the spiny stramonium (*Datura ferox* L.) both occur in Rhodesia as introduced weeds, and are equally poisonous.

*SOLANUM INCANUM* L. (*SOLANACEAE*)
Plate 3.

**Common Names.** Bitter apple. Dinjinsa, Dungwisa, m'Dulukwa (Chishona).

**Description.** A spreading bush of 3-4′. The branches are densely stellately hair, and, together with the underside of the main veins of the leaves, the petioles and pedicels, bear sharp spines. These are broad based, somewhat curved, and about ¼″ long on the branches, smaller elsewhere. The leaves are alternate, long petioled, and usually eliptic with widely sinuate margins. The underside of the leaves is densely stellately hairy, the upper surface much less so, giving the foliage a greyish appearance. The flowers, borne singly or a few together, are about 1″ in diameter, and pale purple, or rarely white, with prominent yellow anthers. The fruit is globose, about 1½″ in diameter, and yellow when ripe. The leaves fall in the dry season, but the fruits stay on for some time after this, and the appearance of the bush at this time is very characteristic.

**Occurrence.** Very widely distributed and common, favouring roadsides and disturbed land.

**Poisonous Properties.** The active principle is an alkaloidal-glucoside called solanin, and it is the unripe fruits which are poisonous, the ripe fruits being harmless. Both human beings and animals are susceptible to poisoning by the unripe fruits. (Steyn, 1934).

*MUNDULEA SERICEA* (Willd.) A. Chev. (*LEGUMINOSAE*)

Plate 3.

**Common Names.** Fish poison bush, Rhodesian silver leaf. um Sece (Sindebele).

**Description.** A shrub or small tree rarely more than 10′ in Rhodesia. The bark is a smoth, green brown on young branches but the older bark is corky, yellowish and fissured. The leaves are alternate and pinnate, with six to ten pairs of oblong or oblong-lanceolate leaflets up to 1½″ long and ½″ wide. The fine pubescence of the leaves gives the bush a silvery-grey appearance. The flowers are in racemes, purple, pea-like, and about ¾″ long. The pods are flattish, about 3½″ long, and ⅓″ wide, rather woody, and have a short, velvety, orange-brown pubescence.

**Occurrence.** Common throughout Rhodesia, occurring in both low veld and high veld. Flowers October-November.

**Poisonous Properties.** This plant is probably harmless to human beings and cattle, but the bark and root contain an active principle identical or closely related to the rotenone of Derris-type insecticides. This is a powerful fish poison, and the pounded bark and root thrown into water, poisons the fish which float to the surface and can be readily caught. (Steyn, 1934).

*ORNITHOGLOSSUM VIRIDE* (L.f.) Dryand (*LILIACEAE*)

Plate 4.

**Common Name.** Cape Slangkop.

**Description.** A perennial arising from an underground corm about 1″ in diameter. This is produced upwards in a neck up to 6″ long according to the depth of the corm. The stem is simple, and bears 6 or less narrowly lanceolate leaves about 6″ long. Their bases sheath the stem, and they are smooth and glabrous. The terminal inflorescence is a loose raceme with not more than ten flowers. Each flower is borne on a downward curving pedicel of about 2″, and the narrow perianth segments are about ½″ long, and chocolate or dull purple-brown in colour. The illustration shows the stem and leaves as rather more robust than they really are.

**Occurrence.** Fairly widely distributed on the sandveld, and as it is rather an inconspicuous plant when growing with grasses it may be more common than it appears. Plants do not usually occur in colonies, but are rather scattered.

**Poisonous Properties.** The plant is a severe poison and kills within a short time. The symptoms are similar to those of tulp poisoning. (Steyn, 1934).

*RICINUS COMMUNIS L.* (*EUPHORBIACEAE*)
Plate 4.

**Common Names.** Castor Oil Plant. Mu Futa (Chishona).

**Description.** Shrub of 3-5′ with hollow reddish branches. Leaves alternate on long petioles, palmately 5-9 lobed with the lobes serrate; the whole leaf up to 9″ long and 10″ wide. The leaves have each a pair of linear stipules, but these soon fall off and leave scars on the branches. The inflorescence is a raceme 3-6″ long at the ends of the branches with the female flowers above, and the male flowers below. The exserted stigmas of the female flowers are red. The fruit is a three-lobed capsule about a ½″ long or rather more, covered with stiff hairs, and this breaks up when ripe into one-seeded portions. The seeds are mottled, about ⅓″ long, somewhat flattened, and possess a caruncle or warty protuberance at one end of the seed.

**Occurrence.** This plant is quite common as a weed along roadsides, and in cultivated or waste lands.

**Poisonous Properties.** The seeds contain a poisonous principle known as "ricin" and it is the seeds which consistute a danger to children or to stock if they are accidentally mixed with stock-feed. Even a few seeds can be dangerous to either human beings or animals. (Steyn, 1934).

*LASIOSIPHON KRAUSSIANUS* (Meisn.) Meisn.
(*THYMELIACEAE*)
Plate 4.

**Common Names.** Yellow Heads. Chiao (Zezuru).

**Description.** A perennial which sends up clusters of 10-40 annual stems about 1′ in height from a large, woody root, several inches in diameter. These stems are unbranched as a rule, and bear many crowded, alternate, almost sessile leaves, each about 1″ long. The shape of the leaves is variable, but usually more or less lanceolate with an obtuse, mucronate apex. The hairiness of the leaves and stems is also extremely variable; they may be glabrous, slightly hairy, or densely covered with golden hairs. The flowers are a bright yellow, and are borne 30-40 together in dense heads at the ends of the branches. The heads are about 1-1½″ in diameter, and the individual flowers are narrowly tubular and about ½″ long.

**Occurrence.** Very common in open savannah woodland throughout the high veld, sending up its annual shoots and flowering in the spring. Comes along very rapidly after veld fires.

**Poisonous Properties.** The root of the plant is widely known to contain violent poison (Holland, 1913), and although the grazing of the foliage has not been proved to be harmful to stock under Rhodesian conditions, it is reputed to be so elsewhere. (Bull. Imp. Inst. 1910). The Southern Rhodesian Government Analyst has recently investigated a case of native poisoning due to eating the roots of this plant.

*MELIA AZEDARACH L.* (*MELIACEAE*)

Plate 4.

**Common Names.** Syringa, China tree, Persian lilac, Indian lilac, white cedar, etc.

**Description.** A tree with a straight bole, and up to 40′ with a spreading crown. Leaves compound 9-18″ long, bipinnate or sometimes tripinnate. Leaflets 3-12 opposite, sub opposite, or alternate ovate, or lanceolate serrate, or entire acuminate, base more or less oblique from ½-3″ long by ¼-1¼″ wide. Flowers many in panicles towards the ends of the branches, from ¼-⅓″ long, pale mauve, very sweet scented. Fruit, a globose fleshy drupe about ½″ in diameter.

**Occurrence.** Widely planted as a street tree and in gardens in Rhodesia, but seen occasionally as an escape from cultivation. Flowers in August-September.

**Poisonous Properties.** The leaves, flowers and fruit of the tree are all poisonous, but it is the latter which constitutes the greatest danger. Pigs are particularly susceptible, but human beings, goats and fowls may all suffer in greater or lesser degree. Death may occur in two days or less according to the amount eaten (Steyn, 1934). Children have also been known to develop malignant ulcers after forcing the fruits into their nostrils. (Steyn, 1941).

*PTERIDIUM AQUILINUM* (L.) Kuhn (*POLYPODIACEAE*)

Plate 5.

**Common Name.** Bracken Fern.

**Description.** A perennial arising from a stout creeping rhizome running for a considerable distance just beneath the soil. Fronds arise singly at intervals along the rhizome, are thrice pinnate, and may be up to 3′ long and 2′ wide, but are usually a good deal smaller under Rhodesian conditions. The pinnae are opposite sessile, and taper from the base, and are divided into narrow bluntly pointed pinnules. These bear a continuous involucre around their margins containing minute brown spores. The whole frond is dark green and rather leathery for a fern, and more or less hairy below. The stipe or stalk of the frond is characteristically a polished brown.

**Occurrence.** Scattered through Rhodesia, but commonest on grassy hills in the Eastern District. Probably indicates rather poor grazing.

**Poisonous Properties.** Very large amounts of this plant have to be eaten before poisoning ensues. Amounts of from 160 lbs. to almost 600 lbs. are quoted by Steyn (1934), as being necessary to produce symptoms of poisoning in various farm animals. In addition, animals are unlikely to eat it unless normal edible vegetation is almost absent, although, in a recent case in England (Wells, 1949), cattle were poisoned because their grass was so lush that they developed a craving for fibrous food, and so ate large quantities of bracken to satisfy this need.

This danger was later avoided by feeding good hay as a supplementary. The probability of bracken poisoning in Southern Rhodesia is not very great.

### *DIPLODIA ZEAE* (Schw.) Lév. (*FUNGUS*)

Plate 5.

**Common Names.** "Diplodia," Dry Rot.

**Description.** There are several kinds of cob rot of maize but only that due to *Diplodia zeae* is known with certainty to be poisonous. Cobs may be partially or wholly infected, the diseased part being of a light brown colour with wisps of white fungus growing on the grain, or more particularly between the rows. As the disease progresses, the grains take on a darker colour, and may eventually turn nearly black, whilst at the same time they shrink considerably, so as to leave spaces between them. Infection may start at the tip or the butt or fungus may even penetrate right through the sheath, in which case the white fungal mat can be seen on the outside and between the layers of the sheath. Badly diseased cobs are also light in weight.

The disease should not be confused with the common pink cob rot or the black rot which is rather rare. Neither should it be mistaken for smut which turns all the grain to a black powder.

**Occurrence.** "Diplodia" in maize is general throughout Southern Rhodesia, but varies in intensity from season to season, being favoured by heavy late rains.

**Poisonous Properties.** Maize infected with *Diplodia zeae* causes inco-ordination of movement, paralysis or death in cattle and it has been reported that small quantities only are necessary to produce symptoms. Pigs and poultry appear to be unaffected, whilst reports differ in respect to sheep.

The pink rot fungus produces a poison in barley, but infected maize if fed in small quantities (not exceeding 20 per cent.), mixed with normal fodder is said to be harmless.

If cattle are turned into maize lands after reaping to browse on the stover, there is every chance of their picking up diseased cobs which may cause their deaths. Such cobs therefore should not be discarded in the lands at harvest, but should be collected and burnt. Maize stalks infected by *D. zeae* are not known to be poisonous.

Methods for the control of "Diplodia" in maize comprise essentially:

(1) Suitable crop rotations.

(2) Seed disinfection with a mercurial dust.

(3) Field hygiene and the disposal of infected trash by making compost of it.

*SARCOSTEMMA VIMINALE* R.Br. (*ASCLEPIADACEAE*)
Plate 5.

**Common Name.** Leafless milkweed.

**Description.** A rather succulent, trailing, perennial, with cylindric green stems up to ⅓″ diameter, and containing a copious milky latex. The branches are arranged in opposite manner and are leafless. The flowers are greenish white and are borne in sessile umbels at the nodes. The fruits are narrow, smooth follicles, usually paired, and up to 4″ long. The seeds bear a tuft of silky white hairs.

**Occurrence.** Common in the Marandellas District and elsewhere in the high veld, trailing over granite outcrops and kopjes. At lower altitudes it is more often found trailing over bushes and small trees.

**Poisonous Properties.** One or two pounds of the fresh or dried plant has been proved to be sufficient to kill a sheep in a day or two. The symptoms resemble those of strychnine poisoning. (Steyn, 1937, and Van der Walt and Steyn, 1939).

*EQUISETUM RAMOSISSIMUM* Desf. (*EQUISETACEAE*)
Plate 5.

**Common Names.** Horsetail Dronkgras.

**Description.** A perennial growing from a slender creeping rhizome. The grey-green hollow stems are weak and often trailing. They are made up of finely-ribbed cylindric, segments, tipped by minute black teeth. In younger specimens, the stems are simple, but when older become branched or irregularly whorled. The minute spores are borne in ellipsoidal terminal spikes, rather like small pine cones, and are about ½″ long.

**Occurrence.** Widespread but not very common along stream sides.

**Poisonous Properties.** A few pounds of the green plant are sufficient to produce symptoms of poisoning in sheep, and it is probably poisonous to other stock. An affected animal displays symptoms of apparent drunkenness, hence one of its Afrikaans names (Dronkgras), and shivering. In many cases, animals appear to recover in a few days. (Steyn, 1934).

## GLOSSARY

*acuminate*—having a gradually diminishing point.

*bipinnate*—a leaf with both primary and secondary divisions arranged in a pinnate manner.

*capsule*—a dry seed vessel which splits on ripening.

*corm*—a bulb-like organ composed of fleshy stem bases.

*crenate*—with teeth having rounded sides, i.e., scalloped.

*cyme*—a type of inflorescence in which the branching pedicels terminate in approximately one plane.

*drupe*—a stone fruit like a plum.

*follicle*—a type of fruit which opens along a ventral slit to which the seeds are attached.

*glabrous*—smooth, without hairs.

*involucre*—the organ containing the spores of a fern or the flower of a flowering plant with a compound inflorescence.

*lanceolate*—narrow, tapering to each end.

*linear*—usually applied to a leaf which is very narrow along its whole length.

*mucronate*—with a short, straight point at the apex.

*ovate*—egg-shaped, with the broader end basal.

*palmately-lobed*—a leaf, lobed so that its lobes radiate from the apex of the petiole.

*panicle*—a loose-flowered cluster, a branched raceme or corymb.

*pedicel*—the stalk of a single flower.

*peduncle*—the stalk of a cluster of flowers.

*perianth*—the calyx and petals of a flower together, a term often used when these are not distinguishable from each other.

*petiole*—the stalk of a leaf.

*pinnate*—with leaflets arranged on both sides of a common stalk.

*pinnules*—the ultimate divisions of a divided leaf.

*pubescent*—clothed with soft, short hairs.

*raceme*—a type of inflorescence with a lengthened axis and equally pedicellate flowers.

*rhizome*—an underground stem behaving like a root.

*serrate*—with saw-like teeth.

*sessile*—a leaf or other organ with no stalk.

*stipule*—small appendages borne at the point of leaf insertion.

*umbel*—an inflorescence in which all the flower pedicels arise at one point.

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# Agricultural Experiment Station Salisbury

## Annual Report of Experiments, Season 1948-49

*Published with the Approval of the Chief Agriculturist*

By A. G. H. RATTRAY, B.A. (Cantab), Agriculturist

### Analysis of Rainfall

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | Season | Av. of 26 Seasons |
|---|---|---|---|---|---|---|---|---|---|
| Number of rain days | 7 | 8 | 8 | 13 | 9 | 6 | 3 | 54 | 75 |
| Falls of over ¼ in. ... | 3 | 6 | 5 | 5 | 5 | 2 | 0 | 26 | 37 |
| Total in ins. | 1.51 | 5.57 | 3.86 | 5.25 | 3.37 | 2.18 | .25 | 21.99 | 31.01 |

A few falls occurred in October and early November, but these were insufficient for planting. A heavy storm of over 2″ completely soaked the land on November 21st. No rain during the first three weeks of December affected not only the early sown crops, but delayed later plantings until almost Christmas. Good rains fell during January and early February, and then ceased abruptly, the only subsequent fall of any value being on March 1st. The seasonal total was almost 10″ below normal; and, taken as a whole, distribution was poor, and in marked contrast to 1947-48. There were several heavy falls accompanied by high winds when the loss from run-off was considerable. More than 1″ fell during the first week of May, too late however to benefit crops.

**General.** The season was more suited to early sown crops. For the first time, hybrid maize seed was used in some of the general trials and experiments, and next year it will be planted in all the rotations instead of open-pollinated Hickory King. The maize crop was variable. Among the later sown inbred strains, planted on December 21st, many found the very dry conditions prevailing in the latter part of the season so severe that they produced hardly any grain. Yields in the early sown hybrid strain trials were high, but in some experiments the maize appeared to ripen prematurely. At harvesting, a fair amount of disease was found on the ears, probably attributable to the late rain in May. Stalk borer was very troublesome during the early part of the season. Dusting a little D.D.T. powder into the heart of each young plant, treatment which had given excellent results during 1947-48, was only a partial success. Maize planted in January as a trap-crop attracted the bulk of the later egg-laying moths, and at the time when it was cut for ensilage was heavily infested with larva of all sizes. In consequence, the main crop, and particularly those plots in close proximity to the trap crops, was noticeably free at harvesting from stalk borer damage to the ears.

Amongst the legume crops, soya beans were most affected by the dry conditions. The inadequacy of the rainfall in a season such as 1948-49 to supply sufficient moisture to mature a good soya bean crop was demonstrated by the results in the oil and protein trial. Here the commonly grown varieties of groundnuts are compared with a range of soya bean strains for their yields of oil and protein; and this season each of the four groundnut varieties included in the trial, although by no means producing exceptional crops, yielded not only a greater quantity of oil per acre, but also more protein. Previously the better soya bean strains had always supplied a greater weight of protein per acre.

The early-maturing, dwarf varieties of sunflowers, seed of which was bulked on the station last season, were on trial for the first time; and although quite severely damaged by birds, gave yields which compared favourably with those obtained from the tall black-seeded Russian variety in the past. In view of the fact that harvesting of these dwarf strains will be possible with a combine, they may prove a profitable substitute for the tall varieties which have to be reaped by hand. Oats made very poor growth, and gave yields similar to those in 1946-47, another exceptionally dry season. Sweet potatoes were grown on the station for the first time since the crop was destroyed in January, 1945, following the appearance of the weevil, *Cylas formicarius*, on imported material. The new variety, Victor, showed great promise.

**Crop Rotation Experiments.** These consist of three series laid down in 1913, 1919, and 1926, respectively. On occasions it has been necessary to make changes in these rotations, and in 1946 it was decided to divide these plots in two, and whilst continuing with the old rotations on one half, amended systems have been adopted on the other. Yields obtained in these amended systems are included in the station's report for the first time this year, but they cover two short a period to show the full effect of the changes.

**Yields of Maize (in bags of 200 lbs. nett per acre)**

| System | Date commenced | Season and Rainfall (in inches) | | | | | | | | Yield Averages | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26.42 1941-42 | 45.15 1942-43 | 34.36 1943-44 | 34.59 1944-45 | 33.25 1945-46 | 20.86 1946-47 | 29.15 1947-48 | 21.99 1948-49 | No. of crops | Yield |
| A1 | 1913 | 5.12 | 250 P<br>4.15 | 8.93 | 5.38 | 250 P<br>4.45 | 3.97 | 300 P<br>4.90 | 6.00 | 8(1941-49)<br>21(1928-49) | 5.36<br>5.98 |
| A2 | 1928 | G.M. | 250 P<br>11.65 | 9.20 | G.M. | 250 P<br>16.45 | G.M. | 300 P<br>16.50 | G.M. | 13(1928-49) | 12.98 |
| E1 | 1919 | 3.60 | 1.45 | 5.72 | 5.85 | 2.92 | 1. T.Lime<br>3.98 | 5.97 | 4.85 | 8(1941-49)<br>11(1938-49)<br>21(1928-49) | 4.29<br>4.54<br>4.88 |
| E2 | 1938 | Legume Compost | 9.90 | 7.65 | Legume Compost | 9.68 | G.M. | 11.70 | G.M. | 6(1938-49) | 9.66 |
| G1 | 1919 | 200 P<br>4.55 | 4.68 | 200 P<br>9.45 | 4.80 | 200 P<br>3.80 | 3.70 | 200 P<br>4.45 | 5.05 | 8(1941-49)<br>30(1919-49) | 5.06<br>9.09 |
| G2 | 1946 | | | | | | 1. T.Lime<br>4.00 | 400 Comp.<br>8.25 | 7.50 | 3(1946-49) | 6.58 |
| N1 | 1926 | 200 P<br>5.16 | 1.95 | 200 P<br>7.24 | 5.83 | 200 P<br>2.15 | 3.13 | 200 P<br>10.75 | 5.40 | 8(1941-49)<br>23(1926-49) | 5.20<br>6.74 |
| N2 | 1946 | | | | | | 2. T.Lime<br>2.55 | 300 Comp.<br>11.05 | 8.65 | 3(1946-49) | 7.42 |

**System A—Maize continuously.** For the first fifteen years the maize grown under this system received no fertiliser, during which period yields declined gradually, although they were subject to seasonal fluctuations. In 1928, with the object of comparing the value in raising the yields of maize of a green manure crop supplemented by phosphates, as against phosphates alone, the plot was divided in two. On the one half, A1, applications of phosphates were made at the rate of 250 lbs. every third year, subsequently increased in 1947 to 300 lbs. in every second year. On the other, A2, similar dressings of phosphates to those in A1 have been applied, and a green manure crop was grown every third year until 1947, when the period was shortened to every second year.

The yields from these plots since 1928 show the value of a green crop in a striking manner. System A1 has produced approximately 126 bags from an acre during this period, whilst system A2 has produced 169 bags, although in 8 out of the 21 seasons the land was unproductive in that it was under green manure.

**System E—Maize continuously with no fertiliser.** In 1938, this plot was divided, and on the one half, the maize crop was replaced in every third season by a legume, which was removed, composted and returned to the plot. This was a laborious practice compared with turning the legume under for green manure, and in 1946 it was brought into line with system A2, since when the legume has been grown every second year and ploughed under. Except that plot E1 now receives a dressing of 1 ton of lime in every fourth year, a comparison of the yields in systems E1 and E2 with those in A1 and A2 gives the value of the phosphate dressings. It would appear that the phosphates are more beneficial where there is a better supply of organic matter; thus A2 has given a greater increase in yield over E2 than A1 over E1.

**System G—Maize continuously.** In this system no manure or fertiliser was applied until 1929-30, since when a dressing of 200 lbs. of phosphates is applied every second year. Yields during the last eight seasons have been slightly lower than in system A1 where the dressing of phosphates is a little heavier.

In the amended system G2, apart from the dressing of lime every fourth year, 400 lbs. complete fertiliser is being applied every second year.

**System N—Maize continuously.** Receives 200 lbs. of phosphates in alternate years. The amended system, N2, receives a dressing of 2 tons of lime every fourth year, together with 300 lbs. of complete fertiliser every second year.

Yields of Maize (in bags of 200 lbs. nett per acre)

| System | Date commenced | Season in Rainfall (in inches) | | | | | | | | Yield averages | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26.42<br>1941-42 | 45.15<br>1942-43 | 34.36<br>1943-44 | 34.59<br>1944-45 | 33.25<br>1945-46 | 20.86<br>1946-47 | 29.15<br>1947-48 | 21.99<br>1948-49 | No. of crops | Yield |
| B1 | 1915 | 5.18 | 4.34 | 8.80 | 3.89 | 5.58 | 2.82 | 5.85 | 3.70 | 8(1941-49)<br>34(1915-49) | 5.02<br>7.87 |
| B2 | 1946 | | | | | | 6 K.C.<br>+ 300 P<br>5.30 | 6 K.C.<br>+ 300 P<br>9.30 | 6 K.C.<br>+ 300 P<br>13.50 | 3(1946-49) | 9.37 |
| C1 | 1915 | 9.48 | 5.15 | 6.18 | 6.18 | 4.65 | 2.90 | 8.00 | 3.70 | 8(1941-49)<br>34(1915-49) | 5.78<br>10.91 |
| C2 | 1946 | | | | | | 6 K.C.<br>+ 300 P<br>5.90 | 6 K.C.<br>+ 300 P<br>19.30 | 6 K.C.<br>+ 300 P<br>11.65 | 3(1946-49) | 12.28 |
| Average of 2 plots D1 | 1916 | 9.95 | 5.74 | 12.08 | 13.17 | 10.15 | 7 20 | 12.11 | 10.95 | 8(1941-49)<br>25(1924-49) | 10.17<br>13.73 |
| Plot following beans | | 8.53 | 5.90 | 12.63 | 14.78 | 9.33 | 6.10 | 9.98 | 12.50 | 8(1941-49)<br>25(1924-49) | 9.97<br>13.69 |
| Plot receiving dung | (6 K.C.) | 11.37 | 5.57 | 11.53 | 11.56 | 10.96 | 8.30 | 14.25 | 9.40 | 8(1941-49)<br>25(1924-49) | 10.37<br>13.77 |
| D2 | 1946 | | | | | | | | | | |
| Average of 2 plots | | | | | | | 6.85 | 14.51 | 13.70 | 3(1946-49) | 11.69 |
| Plot following beans | | (300 P) | | | | | 4.05 | 10.67 | 13.20 | 3(1946-49) | 9.31 |
| Plot receiving dung | (12 K.C. + 300 P) | | | | | | 9.65 | 18.35 | 14.20 | 3(1946-49) | 14.07 |

**System B.** This rotation was originally maize alternated with a bare summer fallow, but in 1929 the fallow was replaced by a bean crop for hay. No fertiliser is applied. In 1946 the plots were divided, and an amended system, B2, started on the one half. In this amended system the maize plot receives a dressing of 6 tons of kraal compost to the acre, and 300 lbs. of phosphates each year. Yields in B1 are now very low; not as high as the maize continuous plots where fertiliser is applied. In a system such as this, where half the land each year is growing a legume for hay, it is reasonable to assume that a considerable quantity of kraal compost would be available for returning to the land. The yields in B2 are increasing steadily; the higher yield of 13.50 bags in 1948-49, a season of poor rainfall, when compared to the 9.30 bags in a good season, is probably because 1948-49 starts the second cycle, and so this maize plot is the first plot to receive a second compost dressing.

**System C—A 3-course rotation.** Maize, followed by velvet beans for seed, followed by oats. No manure or fertiliser. The amended system C2, started in 1946, allows for a dressing of 6 tons of kraal compost and 300 lbs. of phosphates to each maize crop. This has more than doubled the yields of maize, but as the first cycle of three years only ends with the season under review, none of the three plots has had a second manurial dressing yet, and consequently the current yield is lower than in B2.

The oat crop in the amended rotation receives a dressing of 100 lbs. of phosphates per acre which has proved beneficial. Oats, coming two years after maize in the rotation, could not be affected by the compost until this season, when the extremely dry conditions caused such poor growth on all oat plots that its effect could not be guaged.

**System D—A 4-course rotation.** Maize (plus 6 tons of dung per acre), followed by oats, followed by beans for hay, followed by maize. The amended system now being carried out on one-half of the plots receives a dressing of 12 tons of dung on the second crop of maize (that preceding the oats), and both maize crops receive phosphates at 300 lbs. per acre. The comparative yields of systems D1 and D2 will be more informative when system D2 has been in progress for a longer period. The average yield of the two maize plots in system D1 is much higher than those in rotations B1 and C1, showing the beneficial effect of a small dressing of manure once in four years.

**Yields of Maize (in bags of 200 lbs. nett per acre)**

| System | Date Commenced | Season and Rainfall (in inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 26.42<br>1941-42 | 45.15<br>1942-43 | 34.36<br>1943-44 | 34.59<br>1944-45 | 33.25<br>1945-46 | 20.86<br>1946-47 | 29.15<br>1947-48 | 21.99<br>1948-49 |
| F.1 1 | 1919 | SUDAN | 200 P<br>9.78 | 8 K.C.<br>12.70 | 9.40 | SUDAN | 200 P<br>3.92 | 8 K.C.<br>12.85 | 8.65 |
| 2 | | 10.30 | SUDAN | 200 P<br>9.28 | 8 K.C.<br>14.25 | 9.10 | SUDAN | 200 P<br>10.30 | 8 K.C.<br>9.30 |
| 3 | | 8 K.C.<br>9.55 | 6.45 | SUDAN | 200 P<br>7.45 | 8 K.C.<br>8.82 | 7.80 | SUDAN | 200 P<br>8.15 |
| 4 | | 200 P<br>7.10 | 8 K.C.<br>7.30 | 12.80 | SUDAN | 200 P<br>5.22 | 8 K.C.<br>8.03 | 12.00 | SUDAN |
| | Mean = | 8.98 | 7.84 | 11.59 | 10.37 | 7.71 | 6.58 | 11.72 | 8.70 |
| F2 1 | 1940 | S5.93 | 200 P<br>7.20 | 3 K.C.<br>S8.55 | 15.53 | S4.43 | 200 P<br>9.25 | 8 K.C.<br>S8.75 | 8 K.C.<br>18.70 |
| 2 | | 11.93 | S6.30 | 200 P<br>18.00 | 8 K.C.<br>S8.20 | 14.92 | S3.00 | 200 P<br>14.45 | 8 K.C.<br>S4.55 |
| 3 | | 8 K.C.<br>S4.88 | 10.37 | S7.80 | 200 P<br>14.45 | 8 K.C.<br>S5.82 | 8 K.C.<br>10.00 | S8.25 | 200 P<br>18.10 |
| 4 | | 200 P<br>9.13 | 8 K.C.<br>S7.90 | 20.68 | S5.90 | 200 P<br>11.90 | 8 K.C.<br>S5.70 | 8 K.C.<br>17.50 | S4.35 |
| | Mean = | 10.53 | 8.78 | 19.34 | 14.99 | 13.41 | 9.62 | 15.97 | 18.40 |

DRESSING OF 1 TON OF LIME APPLIED TO ALL PLOTS IN F2 IN 1946-47

S = SOYA BEANS

**Yield Averages (in bags per acre)**

| System | No. of Crops | Maize & P. | Maize & Dung | Maize | Soyas & Dung | Soyas |
|---|---|---|---|---|---|---|
| F1 | 8(1941-49) | 7.66 | 10.35 | 9.56 | | |
| | 20(1929-49) | 10.46 | 12.76 | 11.22 | | |
| F2 | 5(1941-46) | 12.14 | | 14.68 | 7.07 | 6.07 |
| | 3(1946-49) | 13.93 | 15.40 | | 6.34 | 5.20 |

**System F—Three crops of Maize followed by Sudan Grass.** The second crop of maize receives a dressing of dung at the rate of 8 tons per acre. Originally no fertiliser was applied in this rotation, but since 1929 the maize crop following Sudan Grass has received phosphates at the rate of 200 lbs. per acre. In 1940, plots were divided, and a new rotation including Soya Beans started on the one half. This new system, called F2 in the table of yields, consists of maize plus phosphates, Soya Beans plus 8 tons of dung to the acre, Maize, Soya Beans. In 1946, the F2 rotation was amended to receive a second dressing of 8 tons of dung, applied to the Maize crop following the Soyas receiving the dung.

System F1 shows very well the beneficial value of dung on the yields of maize. The rotational value of a crop of Sudan Grass, grown every fourth year, and allowed to mature for seed, must be considered low, so that a dressing of 8 tons of dung every fourth year is chiefly responsible for the fact that yields, as evidenced by figures over the last eight years, still average over 9 bags to the acre, in a rotation which was laid down in 1919. The amended F2 system, with two dressings of dung in the 4-year period, looks like producing very high yields once it has been in progress sufficiently long to bear full effect. Soya bean yields were well below average due to the dry season.

**System H—A 4-course rotation.** Velvet beans ploughed under as green manure followed by three crops of maize. Originally only the third crop of maize received a dressing of phosphates at the rate of 200 lbs. per acre, but subsequently it was decided to give a similar application to the maize following the green manure.

The yield averages, taken from system H1 over the period 1941-49 show that the full beneficial effect of a green manure crop only lasts one year. The second successive crop of maize

### Yields of Maize (in bags of 200 lbs. nett per acre)

| System | Date commenced | Season and Rainfall (in inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 26.42<br>1941-42 | 45.15<br>1942-43 | 34.36<br>1943-44 | 34.59<br>1944-45 | 33.25<br>1945-46 | 20.86<br>1946-47 | 29.15<br>1947-48 | 21.99<br>1948-49 |
| | | | 200 P | | 200 P | | 200 P | | 200 P |
| H1 1 | 1919 | G.M. | 12.33 | 11.05 | 6.50 | G.M. | 11.10 | 9.70 | 9.70 |
| | | 200 P | | 200 P | | 200 P | | 200 P | |
| 2 | | 6.70 | G.M. | 18.55 | 6.70 | 5.10 | G.M. | 15.65 | 10.45 |
| | | | 200 P | | 200 P | | 200 P | | 200 P |
| 3 | | 7.20 | 4.75 | G.M. | 19.70 | 6.92 | 7.30 | G.M. | 15.55 |
| | | 200 P | | 200 P | | 200 P | | 200 P | |
| 4 | | 11.63 | 6.70 | 12.08 | G.M. | 16.35 | 4.30 | 8.23 | G.M. |
| | Mean = | 8.51 | 7.93 | 13.89 | 10.97 | 9.46 | 7.57 | 11.19 | 11.90 |
| | | | | | | | 300 P | | 300 P |
| H2 1 | 1946 | | | | | | 11.43 | G.M. | 17.90 |
| | | | | | | | | 300 P | |
| 2 | | | | | | | G.M. | 17.15 | G.M. |
| | | | | | | | 300 P | | 300 P |
| 3 | | | | | | | 7.40 | G.M. | 17.85 |
| | | | | | | | | 300 P | |
| 4 | | | | | | | G.M. | 14.90 | G.M. |
| | Mean = | | | | | | 9.42 | 16.03 | 17.87 |

### DRESSING OF 1 TON OF LIME APPLIED TO ALL PLOTS IN H2 IN 1946-47

**Yield averages (in bags of 200 lbs. nett per acre)**

1941-49 (H1)

1. Maize after green manure+200 lbs. phosphates=15.11
2. Second crop of maize after green manure= 7.88
3. Third crop of maize after green manure+200 lbs. phosphates= 7.55

produces little more than half the weight of grain obtained from the first. System H2 is producing as much grain from two crops of maize as system H1 produces from three. That the extra 100 lbs. of phosphates applied in alternate years in system H2 is not responsible to any extent for this can be seen from the yields in the maize continuous plots. The increased yields in both H1 and H2 when compared with the figures for the more favourable season 1947-48 can be explained in H2 where the change-over to more frequent green manure crops is probably still raising the level of yields, but no such reason is apparent for similar results in H1.

**System M—A 4-course rotation.** Green manure, followed by maize plus 200 lbs. of phosphates per acre, followed by ground nuts, followed by maize plus 200 lbs. of phosphates per acre. In the amended rotation, M2, the groundnuts receive a dressing of 8 tons of kraal compost, whilst all plots receive a dressing of 2 tons of lime per acre every fourth year, starting in 1946.

### DRESSING OF 2 TONS OF LIME APPLIED TO ALL PLOTS IN M2 IN 1946-47

**Yield averages in bags of 200 lbs. nett per acre (for 1941-48) (M1)**

1. Maize after green manure ...... = 13.77
2. Maize after ground nuts ...... = 11.06
3. Mean of two maize plots ...... = 12.41

The maize plot following ground nuts in system M2 has benefitted considerably from the compost given to the nuts, and has yielded five bags an acre more than the corresponding maize plot in M1. Nevertheless the original system has proved capable of maintaining maize yields at over twelve bags an acre and is comparable to a system in which green manure is followed by two crops of maize.

**System O—A 4-course rotation.** Maize plus 200 lbs. of phosphates per acre, followed by sweet potatoes, followed by maize plus 8 tons of kraal compost per acre, followed by beans for hay. In the amended rotation, M2, started in 1946, both crops of maize receive a dressing of 8 tons of kraal compost and 300 lbs. of phosphates. For some years, sweet potatoes have been replaced in the rotation by edible canna.

Over the period tabulated in the original system, the crop of maize receiving the dressing of compost has yielded 1.36 bags an acre more than the maize following the legume hay. This difference is not very great, probably because the legume has a more beneficial effect on the following cereal crop than either sweet potatoes or canna.

Yields of bean hay and of sweet potatoes and edible canna are expressed in tons to the acre.

Yields of Maize (in bags of 200 lbs. nett per acre)

| System | Date commenced | Season and Rainfall (in inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 26.42<br>1941-42 | 45.15<br>1942-43 | 34.36<br>1943-44 | 34.59<br>1944-45 | 33.25<br>1945-46 | 20.86<br>1946-47 | 29.15<br>1947-48 | 21.99<br>1948-49 |
| M1 1 | 1926 | 200 P<br>8.91 | G.M. | 200 P<br>17.67 | Ground Nuts | 200 P<br>8.30 | G.M. | 200 P<br>15.77 | Ground Nuts |
| 2 | | Ground Nuts | 200 P<br>8.36 | G.M. | 200 P<br>16.91 | Ground Nuts | 200 P<br>9.58 | G.M. | 200 P<br>15.20 |
| 3 | | 200 P<br>11.55 | Ground Nuts | 200 P<br>15.90 | G.M. | 200 P<br>13.94 | Ground Nuts | 200 P<br>11.10 | G.M. |
| 4 | | G.M. | 200 P<br>10.23 | Ground Nuts | 200 P<br>14.04 | G.M. | 200 P<br>8.90 | Ground Nuts | 200 P<br>12.30 |
| | Mean = | 10.23 | 9.29 | 16.78 | 15.47 | 11.12 | 9.24 | 13.43 | 13.75 |
| M2 1 | 1946 | | | | | | G.M. | 200 P<br>17.15 | 8 K.C.<br>G. Nuts |
| 2 | | | | | | | 200 P<br>8.20 | G.M. | 200 P<br>14.85 |
| 3 | | | | | | | 8 K.C.<br>G. Nuts | 200 P<br>12.70 | G.M. |
| 4 | | | | | | | 200 P<br>9.90 | 8 K.C.<br>G. Nuts | 200 P<br>17.30 |
| | Mean = | | | | | | 9.05 | 14.92 | 16.07 |

**Yields of Maize (in bags of 200 lbs. nett per acre)**

| System | Date Commenced | Season and Rainfall (in inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 26.42<br>1941-42 | 45.15<br>1942-43 | 34.36<br>1943-44 | 34.59<br>1944-45 | 33.25<br>1945-46 | 20.86<br>1946-47 | 29.15<br>1947-48 | 21.99<br>1948-49 |
| O1 1 | 1926 | 8 KC<br>11.39 | B. Hay<br>2.02 | 200 P<br>16.33 | E. Canna<br>1.09 | 8 KC<br>8.73 | B. Hay<br>1.87 | 200 P<br>9.12 | E. Canna<br>2.15 |
| 2 | | SW. PO.<br>4.06 | 8 KC<br>10.05 | B. Hay<br>2.36 | 200 P<br>14.74 | E. Canna<br>2.20 | 8 KC<br>15.67 | B. Hay<br>2.63 | 200 P<br>15.20 |
| 3 | | 200 P<br>7.35 | SW. PO.<br>2.37 | 8 KC<br>10.41 | B. Hay<br>2.19 | 200 P<br>9.25 | E. Canna<br>.84 | 8 KC<br>17.75 | B. Hay<br>2.04 |
| 4 | | B. Hay<br>1.38 | 200 P<br>6.95 | SW. PO.<br>2.43 | 8 KC<br>12.15 | B. Hay<br>2.26 | 200 P<br>10.95 | E. Canna<br>8.03 | 8 KC<br>14.65 |
| | Mean = | 9.37 | 8.50 | 13.37 | 13.44 | 8.99 | 13.31 | 13.43 | 14.92 |
| O2 1 | | | | | | | B. Hay<br>1.67 | 8 K.C. +<br>300 P<br>14.70 | E. Canna<br>3.44 |
| 2 | | | | | | | 8 K.C. +<br>300 P<br>11.83 | B. Hay<br>2.41 | 8 K.C. +<br>300 P<br>18.20 |
| 3 | | | | | | | E. Canna<br>1.15 | 8 K.C. +<br>300 P<br>18.10 | B. Hay<br>1.98 |
| 4 | | | | | | | 8 K.C. +<br>300 P<br>10.83 | E. Canna<br>9.26 | 8 K.C. +<br>300 P<br>15.35 |
| | Mean = | | | | | | 11.33 | 16.40 | 16.77 |

DRESSING OF 2 TONS OF LIME APPLIED TO ALL PLOTS IN O2 IN 1946-47

## MAIZE ROTATION EXPERIMENT

### Started 1939-40

**Object.** To determine the effect on the yield of maize when a legume is grown in the rotation at varying intervals and used (1) for green manure; (2) as a hay crop; (3) for seed protection.

**Rotation Systems.**

A = Green manure and maize alternating.
B = Leguminous hay crop and maize alternating.
C = Leguminous seed crop and maize alternating.
D = Green manure followed by two crops of maize.
E = Leguminous hay crop followed by two crops of maize.
F = Leguminous seed crop followed by two crops of maize.
G = Green manure followed by three crops of maize.
H = Leguminous hay crop followed by three crops of maize.
J = Leguminous seed crop followed by three crops of maize.
K = Green manure followed by four crops of maize.
L = Leguminous seed crop followed by four crops of maize.
M = A 4-year grass ley followed by four crops of maize.
N = A 3-year grass ley followed by two crops of maize, a green manure crop and two crops of maize.
O = Maize continuously.

**Design.** Randomised plots.

**Replications.** Eight, nine and ten. Each system was replicated sufficiently to ensure an equal number of plots at each phase of the rotation in any one season. (e.g., System D has 9 plots—3 always down to green manure; 3 to maize following green manure; and 3 to the second crop of maize after green manure.) Thus the season influences each system to the same extent.

**Manurial Dressings.** 150 lbs. phosphates (75 lbs superphosphate + 75 lbs. Rock phosphate) per acre per annum to all plots in all systems except M and N. In systems M and N, 200 lbs. phosphates (100 lbs. superphosphate + 100 lbs. Rock phosphate) to all plots except those under grass for more than one season.

**Compost.** Starting in 1945-46, a dressing of 2 tons of compost to the acre is given to all plots in systems B, E and H, each year.

**Table of Maize Yields**

| System | Yields of maize in bags per acre | | | | Total bags of maize obtained from 1 acre under the system practised | |
|---|---|---|---|---|---|---|
| | 1939-40 | 1947-48 | 1948-49 | Ave. of 10 crops | 1939-40 to 1948-49 | 1942-43 to 1948-49 |
| A | 17.0 | 16.8 | 13.9 | 15.7 | 78.7 | 54.2 |
| B | 21.9 | 12.4 | 10.9 | 11.6 | 58.2 | 34.0 |
| C | 18.2 | 10.6 | 10.9 | 10.9 | 54.3 | 31.2 |
| D | 18.3 | 12.7 | 10.7 | 12.2 | 81.5 | 52.4 |
| E | 18.0 | 11.0 | 10.4 | 9.8 | 65.1 | 41.6 |
| F | 17.3 | 8.6 | 8.7 | 8.9 | 59.4 | 36.2 |
| G | 17.7 | 11.6 | 10.2 | 10.5 | 79.0 | 53.9 |
| H | 16.6 | 10.0 | 10.6 | 8.7 | 65.3 | 41.5 |
| J | 17.7 | 9.3 | 7.9 | 8.1 | 61.0 | 39.0 |
| K | 17.6 | 8.6 | 8.1 | 9.6 | 76.4 | 46.6 |
| L | 17.6 | 7.3 | 8.7 | 8.8 | 70.0 | 40.5 |
| M | 16.8 | 7.6 | 8.8 | 8.6 | 43.0 | 27.3 |
| N | 16.5 | 9.0 | 10.2 | 10.1 | 50.6 | 32.7 |
| O | 18.1 | 5.7 | 7.0 | 7.7 | 77.2 | 45.5 |
| Mean | 17.8 | 10.1 | 9.8 | 10.1 | 65.7 | 41.2 |

**Yields of Maize in Green Manure rotations (1945-46 to 1948-49)**

Expressed as percentages of the yield of maize in system A

| System | Year after green manure | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th |
| A | 100 | X | X | X |
| D | 93.7 | 54.4 | X | X |
| G | 91.4 | 56.8 | 49.4 | X |
| K | 86.5 | 51.3 | 40.2 | 39.8 |

When the trial was laid down in 1939 it was intended that sunn hemp should be the legume used for all purposes. It is an ideal green manure and hay crop, and is widely grown on a considerable scale; and, if allowed to mature for seed, has the further advantage of producing fibre suitable for the manufacture of grain bags. However, the increasing severity of damage to the young, early-sown plants by the sunn hemp beetle, made it necessary to delay planting until the last week of December. Thus the full growth and rotational benefit from the legume is lost if sunn hemp is grown; it was therefore decided instead to grow velvet beans or a mixture of velvet beans and sunflowers. Similarly during the early years of the trial, Rhodes Grass was used in rotations M and N; but the desirability, in a three-year ley, of obtaining a full stand early in the first season led to the substitution of Panicum Makarikari which can be established with more certainty.

In those rotations where the legume is ploughed under as green manure, an analysis of the proportion which each successive crop contributes towards the average yield for the system, shows that the figures from this trial are very similar to those from crop rotation H. The yields in those systems in which the green manure is grown at less frequent intervals fall, not so much because of lower yields from the immediately succeeding crop of maize, but because the second and following crops show a big drop. Apart from the application of phosphates, if the growing of a legume for turning under as green manure is to be the only method employed for maintaining the yields of maize, then the most efficient and profitable system is the green crop in alternate years.

Although the application of an annual dressing of 2 tons of compost to all plots, both maize and velvet beans, in those systems where the legume is used for hay, may not have continued sufficiently long to demonstrate full effect, nevertheless a comparison with the relative green manure systems are interesting. It is very unlikely that yields in system B will ever equal those in A, so it appears that a green manure crop is more than equal to 4 tons of compost. But it may well prove that, taken over a long period, the 6 tons of compost applied during the cycle of three years in system E, will give similar results to the one green crop in three years, as represented by system D.

## COMPARISON OF VARIOUS CROPS FOR GREEN MANURES

**Object.** To compare the yields of maize following various crops ploughed under for green manure.

**Green manure crops.**

A = Velvet Beans
B = Sunn Hemp
C = Dhal
D = Sudan Grass
E = Munga

**Design.** Randomised blocks. 10 Replications.

Green manure crops are alternated with maize, and the different green manure crops are planted on the same plots.

**Manurial Dressing.** 200 lbs. phosphates, equal parts of rock and superphosphate, applied to the maize.

**Variety of Maize.** Single hybrid N3-1-4-9 x M9-9-5.

**Date of Planting of Maize.** 30/11/48.

**Distance of Planting.** 3′ x 18″ = 9,680 plants per acre.

### Yields of Maize (in bags of 200 lbs. per acre)

| | | |
|---|---|---|
| A | After Velvet Beans | 20.1 |
| B | After Sunn Hemp | 17.0 |
| C | After Dhal ...... ...... | 15.6 |
| D | After Sudan Grass | 9.2 |
| E | After Munga ...... ...... | 12.8 |

**Significant Difference.** (.05) 1.6 b.p.a.

**Conclusions.** The two non-leguminous crops gave poor results compared with the legumes. The maize following Sudan Grass was yellow in colour and appeared to suffer from nitrogen starvation; after Munga, similar symptoms appeared, but were not so marked.

It should be stated that whilst the velvet beans and dhal were planted in November, and the Sudan Grass and Munga early in December, the sunn hemp could not be sown until the last day of December in order to avoid attack from the sunn hemp beetles, *(exora discoidalis and E. apicipenne)*. The Sudan Grass and Munga were ploughed under on the last day of March, and the other crops ten days later. Thus the period during which the green crop occupied the land was shortened by nearly six weeks if sunn hemp is compared with velvet beans; and this, together with the poor growth of sunn hemp which resulted, was probably responsible for the yield of maize following sunn hemp dropping below that after velvet beans to the extent of three bags an acre.

Cotton was included in this trial, but grew so poorly on this station that the subsequent yields of maize could not be considered to give a true indication of the rotational value of this crop.

### Maize Distance Planting Trial

**Object.** To compare the effect on the yield of maize of different distances of planting. Also to compare the yields of different strains of maize at these spacings.

**Distances of Planting.**

A = 3′ x 18″ = 9,680 plants per acre
B = 3′ x 15″ = 11,616 plants per acre
C = 6′ x 9″ = 9,680 plants per acre
D = 6′ x 15″ – 2 plants per hill = 11,616 plants per acre

**Strains.**

1. Hickory King (open-pollinated)
2. 48H.31 (N3-1-4-9 x A5-7-6)
3. 48 D.H.18 (T4-7-2-4 x K4-2-2-2 x A5-7-6 x N3-1-4-9)

**Design.** Randomised blocks with split plots. 6 Replications.

**Manurial Dressing.** 5 tons kraal compost + 200 lbs. phosphates, equal parts of rock and superphosphate. On land following sunn hemp grown for seed.

**Date of Planting.** 25/11/48. Stand obtained was very good.

**Yields of Maize (in bags of 200 lbs. per acre)**

| Strain | Spacing | | | | Mean |
|---|---|---|---|---|---|
| | 3′ x 18″ | 3′ x 15″ | 6′ x 9″ | 6′x 15″(2) | |
| Hickory King | 16.0 | 19.9 | 16.9 | 16.7 | 17.4 |
| 48H.31 | 19.4 | 22.3 | 14.6 | 19.3 | 19.0 |
| 48D.H.18 | 19.5 | 21.3 | 15.3 | 20.1 | 19.1 |
| Mean | 18.3 | 21.3 | 15.8 | 18.8 | 18.5 |

**Significant Difference.** (.05). Strains = 1.2; Spacing = 1.4; Strain x Spacing = 2.6.

**Conclusions.** The closer distances of planting 3′ x 15″ and 6′ x 15″, 2 plants per hill, each of which means approximately 2,000 extra plants to the acre, have increased the yield in both cases by 3 bags to the acre, when compared with 3′ x 18″ and 6′ x 9″ respectively.

The 3′ spacings have yielded 2.5 bags per acre more than the corresponding 6′ spacings, if the Mean of the three strains is compared.

The two hybrid strains have given a significantly higher yield than Hickory King. The difference between the mean yields of the two hybrid strains and Hickory has been reduced by the results at the 6′ x 9″ spacing.

The following table details the increased yields at the closer spacings.

**Percentage increase at closer spacings**

| Strain | 3′ x 15″ over 3′ x 18″ | 6′ x 15″ over 6′ x 9″ | Mean |
|---|---|---|---|
| Hickory King | 24.4 | − 1.2 | 11.6 |
| 48H.31 | 15.0 | 32.2 | 23.6 |
| 48D.H.18 | 9.2 | 31.4 | 20.3 |
| Mean | 16.2 | 20.8 | 18.5 |

Whilst the additional 2,000 plants per acre has resulted in a greater Mean increase in yield in the case of the two hybrid strains, the exceptional yield of Hickory King in the 6′ x 9″ plots has upset otherwise uniform results. This is the only planting distance at which Hickory King has not been outyielded by the hybrids.

Although in previous seasons any differences in yield have usually favoured the 3′ spacings, such differences have not previously been significant or of the same magnitude as in the season under review.

## THE APPLICATION OF NITROGENOUS FERTILISERS TO MAIZE

**Object.** To ascertain the effect on the yield of maize of nitrogenous fertilisers applied in varying amounts at different stages of the plants growth.

**Nitrogen treatments.**

A = No nitrogen.
B = 250 lbs. S/A per acre at P.
C = 375 lbs. Bloodmeal per acre at P. (equal in $P_2O_5$ to B.).
D = 50 lbs. S/A per acre at P. + 200 lbs. S/A per acre at 6W.
E = 100 lbs. S/A per acre at P. + 400 lbs. S/A per acre at 6W.
F = 250 lbs. S/A per acre at 6W.
G = 500 lbs. S/A per acre at 6W.
H = 250 lbs. S/A per acre at E.T.
J = 250 lbs. S/A per acre at 6W. + 250 lbs. S/A per acre at E.T.
K = 100 lbs. S/A per acre at P. + 200 lbs. S/A at 6W. + 200 lbs. S/A per acre at E.T.

S/A = Sulphate of ammonia. P. = Planting.
6W. = 6 weeks after planting. E.T. = Early tasselling.

**Design.** Randomised blocks. 4 Replications.

**Manurial Dressing.** 200 lbs. phosphates, rock phosphate and superphosphate in equal parts. On land following maize, following a green manure crop.

**Variety of Maize.** Single hybrid N3-1-4-9 x A5-7-6.

**Distance of Planting.** 6′ x 9″.

**Date of Planting.** 26/11/48.

**Yields of Maize (in bags of 200 lbs. nett per acre)**

| A | B | C | D | E | F | G | H | J | K | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| 11.33 | 9.79 | 10.64 | 11.54 | 10.42 | 12.20 | 13.21 | 11.09 | 13.10 | 11.54 | 11.48 |

Treatment differences were not significant.

**Conclusions.** The maize at no stage appeared in any of the different treatments to be suffering from a lack of nitrogen. It is possible that a dry December and a very dry ending to the season from about February 10th onwards discounted the value of the nitrogen dressings at planting and early tasselling, and the only part of the season which could be described as reasonably wet, was that occurring between the application of the 6-week dressing on the 7/1/49 and approximately the end of the first week of February, when the early tasselling applications would be expected to take effect. As those differences which have occurred are not significant it would be rash to speculate on the effect of the different dressings. The trial will be further modified and continued next season.

Representative samples of the grain grown on the plots under treatments A F G and K were submitted to the Chief Chemist for analysis for protein content. The figures themselves show the effect of the nitrogen dressings.

| Treatment | A | F | G | K |
|---|---|---|---|---|
| Protein % | 9.0 | 9.5 | 10.2 | 9.9 |

**The Application of Phosphatic fertilisers to Maize.** This trial is carried out each year on the same block of land with the various treatments repeated on the same plots. The general rotation is velvet beans and sunn hemp ploughed under for green manure followed by two crops of maize, the applications of the different phosphatic fertilisers being made to both maize crops. During the season under review the land was down to green manure.

## MAIZE BREEDING

Over 50 inbred strains, representative of and developed from the various white varieties grown in this country, were planted in duplicate plots for further inbreeding. Previously, only single plots of each strain have been planted, but the necessity for prolonging the flowering period of this material sufficiently to give the limited personnel of the station time to deal with it, has meant spreading the planting of these strains over several weeks. It was therefore impossible to compare with any accuracy the merits of an inbred planted, say at the end of November, with another planted about the 20th of December. The system of duplicate plots, sown on a common date, has enabled a fair comparison between any two strains to be made, although it has proved a greater strain on the limited seed supplies of each individual inbred. The planting of inbreds on the 21st of December suffered so severely during the February-March drought that in some cases the yield was negligible, and for seed next year, it will be necessary to revert to the 1947-48 material.

Larger sample quantities of individual hybrid strains, particularly of double hybrids, are being made for sowing in replicated trials in other parts of the country. They will supply valuable information in respect of those double hybrids which are likely to be produced on a commercial scale. At present the staff of the Cotton Research Station at Gatooma and the Agriculturist stationed in Matabeleland are conducting and supervising annual trials, and it is hoped to extend these to other districts when facilities are available. Requests for trial samples of seed from other territories will be welcomed. It is known that satisfactory results have been obtained outside the Colony by crossing a local open-pollinated variety and an inbred strain bred in Salisbury. The resulting top-cross is sufficiently acclimatised by virtue of its open pollinated parent and acquires greater yielding ability from the prepotent inbred. The ability of double hybrid strains to perform as successfully in areas where conditions differ widely from those experienced on this station must be thoroughly tested before commercial planting can be recommended.

Samples of grain of a number of hybrid strains and of Hickory grown on this station and on farms in the Salisbury district were submitted to the Chief Chemist for analysis in respect of the protein content. There were no indications that the increased yield of grain per acre, obtained by virtue of changing to hybrid seed, was being accompanied by a corresponding fall in protein percentage. Figures are given for Hickory King and the single hybrid N3-1-4-9 x A5-7-6, which was widely grown this year by members of the Southern Rhodesia Seed Maize Association.

### PROTEIN PERCENTAGE (100% DRY MATTER)

| Variety | Gletwyn Farm | Gwebi Govt. Farm | Agricultural Exp. Stn. | Mean |
|---|---|---|---|---|
| Hickory King | 9.1 | 9.0 | 8.9 | 9.0 |
| N3-1-4-9 x A5-7-6 | 10.1 | 9.6 | 8.9 | 9.5 |

### HYBRID STRAIN TRIAL, SALISBURY

**Object.** To compare the yields of various strains of maize.

**Design.** Quasi-factorial. 8 Replications.

**Planting Distance.** 3′ x 18″.

**Manurial Dressing.** 200 lbs. phosphates, equal parts of rock and superphosphate. On land following velvet beans ploughed under as green manure.

**Date of planting.** 22/11/48.

| Strain | Yield in bags per acre | Stand % | Shelling % | Days from planting to first tassels | Ratings for | |
|---|---|---|---|---|---|---|
| | | | | | Suckering | Sheath cover |
| N3-1-3-4 x M9-9-5 | 29.8 | 99 | 86.0 | 65 | 3 | 1 |
| N3-1-4-9 x D5-6-2 x T4-7-2-4 x M7-3-8 | 29.8 | 100 | 85.2 | — | 3 | 2 |
| A5-7-6 x N3-1-4-9 x T4-7-2-4 x M7-3-8 | 28.8 | 100 | 84.8 | — | 2 | 2 |
| N3-2-3-3 x M9-9-5 x K4-2-2-2 x A5-7-6 | 28.6 | 99 | 85.4 | — | 1 | 2 |
| N3-1-3-4 x N2-6-5-6 | 28.6 | 100 | 89.1 | 64 | 0 | 0 |
| M7-3-8 x N2-6-5-6 x T4-7-2-4 x K4-2-2-2 | 28.2 | 100 | 86.1 | — | 2 | 1 |
| N3-1-3-4 x A5-7-6 | 28.2 | 99 | 85.9 | 66 | 1 | 0 |
| K4-2-2-2 x N2-6-5-6 | 28.0 | 99 | 87.1 | 69 | 0 | 0 |
| K4-2-2-2 x A3-9-8 | 27.6 | 100 | 83.0 | 67 | 0 | 0 |
| N3-1-3-4 x M9-9-3-1 | 27.6 | 100 | 85.3 | 65 | 3 | 1 |
| T4-7-2-4 x K4-2-2-2 | | | | | | |

| Strain | Yield in bags per acre | Stand % | Shelling % | Days from planting to first tassels | Ratings for | |
|---|---|---|---|---|---|---|
| | | | | | Suckering | Sheath cover |
| x A5-7-6 x N3-1-4-9 | 27.6 | 100 | 85.0 | — | 1 | 1 |
| N3-1-4-9 x T4-7-2-1 | 27.6 | 99 | 86.2 | 64 | 1 | 1 |
| N3-1-4-9 x M9-9-5 | 27.2 | 100 | 86.1 | 65 | 2 | 2 |
| N3-1-4-9 x A2-5-2 x T4-7-2-4 x M7-3-8 | 27.2 | 99 | 85.7 | — | 2 | 2 |
| N3-1-4-9 x D5-6-5 | 26.8 | 99 | 85.4 | 65 | 0 | 1 |
| N2-6-5-6 x M9-9-5 | 26.8 | 99 | 87.2 | 64 | 1 | 1 |
| N3-2-3-3 x N2-6-5-6 | 26.6 | 99 | 89.1 | 66 | 0 | 1 |
| K4-2-2-2 x N3-1-4-9 xM7-3-8 x N2-6-5-6 | 26.6 | 99 | 86.3 | — | 1 | 1 |
| N3-1-4-9 x A5-7-6 | 26.6 | 99 | 86.0 | 65 | 0 | 1 |
| K4-2-2-2 x A5-7-6 x N2-6-5-6 x N3-1-3-4 | 26.4 | 99 | 85.6 | — | 0 | 1 |
| K4-2-2-2 x N3-1-3-4 | 26.4 | 99 | 87.0 | 67 | 0 | 0 |
| K4-2-2-2 x A2-5-2 | 26.4 | 99 | 83.0 | 68 | 0 | 0 |
| N3-1-3-6 x D5-6-2 x T4-7-2-4 x M7-3-8 | 26.2 | 100 | 85.5 | — | 2 | 2 |
| K4-2-2-2 x N3-1-4-9 x T4-7-2-1 x N2-6-5-6 | 26.2 | 99 | 86.2 | — | 1 | 1 |
| N3-1-4-9 x N2-6-5-6 | 26.0 | 99 | 89.3 | 64 | 0 | 0 |
| N3-1-4-9 x M9-9-3-1 | 26.0 | 99 | 86.0 | 65 | 2 | 2 |
| M9-9-5 x T4-7-2-1 | 26.0 | 100 | 82.4 | 64 | 3 | 2 |
| K4-2-2-2 x A1-7-4 | 25.8 | 99 | 83.6 | 67 | 0 | 1 |
| N2-6-5-6 x T4-7-2-1 | 25.8 | 100 | 87.6 | 64 | 0 | 1 |
| N2-6-5-6 x A2-5-2 | 25.8 | 99 | 86.9 | 64 | 0 | 0 |
| K4-2-2-2 x A5-7-6 | 25.6 | 99 | 83.8 | 65 | 0 | 0 |
| N2-6-5-6 x N3-1-3-4 xD5-6-5 x A1-7-4 | 25,6 | 100 | 85.1 | — | 1 | 1 |
| N3-2-3-3 x M9-9-5 x K4-2-2-2 x A2-5-2 | 25.6 | 100 | 85.2 | — | 2 | 2 |
| D5-6-5 x A1-7-4 x K4-2-2-2 x N3-1-4-9 | 25.4 | 100 | 84.5 | — | 1 | 1 |
| T4-7-2-1 x M9-9-5 | 25.2 | 99 | 81.8 | 64 | 3 | 3 |
| M9-9-5 x A3-9-8 | 25.2 | 98 | 84.3 | 65 | 2 | 1 |
| K4-2-2-2 x N3-1-4-9 | 25.2 | 99 | 86.6 | 68 | 0 | 0 |
| M9-9-5 x N2-6-5-6 | 25.0 | 99 | 85.0 | 65 | 1 | 1 |
| T4-7-2-1 x M9-9-3-1 | 24.8 | 99 | 83.0 | 64 | 3 | 2 |
| N2-6-5-6 x N3-1-3-4 x K4-2-2-2 x A2-5-2 | 24.8 | 99 | 85.3 | — | 0 | 0 |
| Southern Cross (E.H. South) | 24.6 | 100 | 81.9 | — | 1 | — |
| K4-2-2-2 x M9-9-3-1 | 24.4 | 100 | 80.5 | 67 | 1-2 | 2 |
| D10-3-3-8-2 x T4-7-2-1 | 24.4 | 99 | 85.9 | 65 | 1-2 | 1 |
| K4-2-2-2 x N3-1-4-9 x T4-7-2-4 x M7-3-8 | 24.4 | 100 | 84.0 | — | 2 | 1 |
| M9-9-5 x A2-5-2 | 24.2 | 99 | 84.2 | 66 | 2 | 1 |

| Strain | Yield in bags per acre | Stand % | Shelling % | Days from planting to first tassels | Ratings for | |
|---|---|---|---|---|---|---|
| | | | | | Suckering | Sheath cover |
| A5-7-6 x N2-6-5-6 | 24.2 | 99 | 86.5 | 64 | 0 | 0 |
| D10-3-3-8-2 x N2-6-5-6 | 24.2 | 100 | 88.8 | 65 | 0 | 0 |
| K4-2-2-2 x M9-9-5 | 24.0 | 99 | 81.1 | 66 | 1-2 | 3 |
| A5-7-6 x M9-9-5 | 23.6 | 99 | 84.1 | 64 | 2 | 1 |
| Hickory King (J. Wallace) | 23.4 | 99 | 83.1 | — | 2 | — |
| N2-6-5-6 x A5-7-6 | 23.0 | 100 | 86.4 | 63 | 0 | 0 |
| Hickory King (D. Newett) | 23.0 | 99 | 83.5 | — | 2-3 | — |
| K6-8-3-1 x N3-1-3-4 x D5-6-5 x A1-7-4 | 23.0 | 100 | 82.9 | — | 1 | 1 |
| A5-7-6 x N3-1-4-9 x K4-2-2-2 x D5-6-2 | 22.6 | 99 | 84.6 | — | 0 | 1 |
| Hickory King (Mrs. Gray) | 22.6 | 100 | 84.7 | — | 1 | — |
| Salisbury White (Black Bros.) | 22.6 | 99 | 83.0 | — | 1-2 | — |
| M9-9-5 x A1-7-4 | 22.0 | 98 | 82.6 | 65 | 2 | 3 |
| M9-9-5 x D5-6-5 | 22.0 | 99 | 82.8 | 63 | 2 | 3 |
| A5-7-6 x D5-6-5 | 22.0 | 97 | 83.5 | 64 | 0 | 0 |
| D10-3-3-8-2 x A5-7-6 | 21.8 | 100 | 85.4 | 64 | 1 | 1 |
| N3-2-3-3 xM9-9-5 x D5-6-5 x A1-7-4 | 21.8 | 100 | 83.3 | — | 2 | 2 |
| Hickory King (D. McKerral) | 21.6 | 100 | 83.7 | — | 1-2 | — |
| Hickory King (W. Scle) | 20.6 | 99 | 83.1 | — | 1-2 | — |
| Hickory King (J. C. Ross) | 20.0 | 100 | 83.9 | — | 1 | — |
| Average of all Strains | 25.3 | — | — | — | — | — |
| Average of 18 double crosses | 26.0 | — | — | — | — | — |
| Average of 38 single crosses | 25.5 | — | — | — | — | — |
| Average of 8 open-pollinated var. | 22.3 | — | — | — | — | — |

**Differences less than 4.2 bags per acre should not be taken as significant**

**Ratings for Suckering:**

0 = No suckers.
1 = A very little suckering.
2 = Considerable suckering.
3 = Nearly all plants suckering.

**Ratings for Sheath Cover:**

0 = All tips of ears covered.
1 = Occasional tip exposed.
2 = Many tips exposed.
3 = Nearly all tips exposed.

The planting of this trial at the early date of November 22nd, and on land which, in spite of the dry season, was capable of producing yields averaging 25 bags to the acre, provided very favourable conditions for late-maturing strains, such as the open pollinated varieties. Under these circumstances the hybrids, being earlier maturing, are least likely to provide spectacular increases over the standard varieties.

Shelling percentage figures show that the variety Hickory King is usually between 83 and 84 per cent. A characteristic feature of a Southern Cross ear is its very large core, and the low shelling percentage of 81.9 obtained in this trial was to be expected. The inbred N2-6-5-6 has given high figures in all combinations, particularly so when crossed with any of the N3 strains.

The ratings for suckering and the covering of the ear tips also show the influence of individual inbreds on their single hybrid progeny M9-9-5 induces a lot of suckering and many exposed tips, K4-2-2-2 has just the reverse effect.

### Hybrid Strain Trial, Umgusa, Bulawayo

**Design.** Randomised blocks. 4 Replications.

**Planting Distance.** 3′ x 18″. 1 plant per hill.

**Manurial Dressing.** 200 lbs. bone and supers per acre. Third successive crop of maize.

**Date of Planting.** 1/12/48.

| Strain | Yield in bags per acre |
|---|---|
| N3-1-4-9 x M9-9-5 | 26.16 |
| N2-6-5-6 x N3-1-3-4 | 25.70 |
| N3-1-4-9 x A5-7-6 | 25.07 |
| A5-7-6 x N3-1-4-9 x K4-2-2-2 x D5-6-2 | 23.52 |
| K4-2-2-2 x A5-7-6 x N2-6-5-6 x N3-1-3-4 | 23.52 |
| N3-1-4-9 x A2-5-2 x T4-7-2-4 x M7-3-8 | 22.43 |
| Potchefstroom Pearl (R. R. Sharp) | 19.61 |
| Average of all strains | 23.72 |

**Conclusions.** Differences in yield are not significant. This was due to wide variation in plot yields. The yields of the hybrid strains, as measured in bags per acre, are satisfactory when compared with an open-pollinated strain which has been selected for a considerable period for Umgusa conditions.

### Hybrid Strain Trial, Cotton Research Station, Gatooma

**Design.** Randomised blocks. 4 Replications.

| Strain | Yield in bags per acre |
|---|---|
| A5-7-6 x N3-1-4-9 x T4-7-2-4 x M7-3-8 ...... | 15.64 |
| N3-1-4-9 x M9-9-5 ...... ...... ...... ...... ...... ...... | 15.60 |
| N3-1-3-4 x A5-7-6 ...... ...... ...... ...... ...... ...... | 14.67 |
| T4-7-2-1 x M9-9-5 ...... ...... ...... ...... ...... ...... | 14.59 |
| N3-2-3-3 x M9-9-5 x K4-2-2-2 x A5-7-6 ...... | 13.83 |
| Hickory King ...... ...... ...... ...... ...... ...... ...... | 12.69 |
| N2-6-5-6 x N3-1-3-4 x K4-2-2-2 x A2-5-2 ...... | 11.52 |
| Average of all strains ...... ...... ...... ...... ...... | 14.08 |

Differences less than 2.20 bags per acre should not be taken as significant

**Conclusions.** The double hybrid strain which has given the highest yield in this trial also did very well in the Salisbury trial. It is very similar inbreeding to the double hybrid which will be grown commercially by many farmers during the 1949-50 season.

The strain of Hickory King, included as a standard variety in this trial, has been selected for a number of years on the Gatooma station.

### Soya Beans v. Ground-nuts for the production of oil and protein

**Object.** To compare the yields of oil and protein obtained from a number of strains of soya beans and varieties of groundnuts.

**Design.** Randomised blocks.

**Planting Distance.** Soyas 2′ x 6″. Ground-nuts 18″ x 6″.

**Manurial Dressing.** 5 Tons of kraal compost per acre. On hand following maize.

**Date of Planting.** 21/12/48.

**Yields (in lbs. per acre)**

| Variety | Seed | Oil | Protein |
|---|---|---|---|
| Spanish Bunch (Valencia) ...... | 1,215 | 544.3 | 371.8 |
| Virginia Bunch ...... ...... ...... ...... | 1,095 | 469.8 | 323.0 |
| Indian Coromandel ...... ...... ...... | 975 | 410.5 | 274.9 |
| Kasowira ...... ...... ...... ...... ...... ...... | 855 | 401.8 | 259.1 |
| Hernon No. 273 ...... ...... ...... ...... ...... | 660 | 129.4 | 237.6 |
| ,, No. 279 ...... ...... ...... ...... ...... | 608 | 106.9 | 222.3 |
| ,, No. 147 ...... ...... ...... ...... ...... | 608 | 103.3 | 221.1 |
| ,, No. 6 ...... ...... ...... ...... ...... | 570 | 85.5 | 206.9 |
| ,, No. 135 ...... ...... ...... ...... ...... | 556 | 90.1 | 205.8 |
| ,, No. 107 ...... ...... ...... ...... ...... | 533 | 82.0 | 191.7 |
| ,, No. 18 ...... ...... ...... ...... ...... | 525 | 74.5 | 199.5 |
| ,, No. 226 ...... ...... ...... ...... ...... | 503 | 84.9 | 182.9 |
| ,, No. 55 ...... ...... ...... ...... ...... | 465 | 64.2 | 174.8 |
| ,, No. 116 ...... ...... ...... ...... ...... | 405 | 61.6 | 141.7 |
| ,, No. 237 ...... ...... ...... ...... ...... | 360 | 56.5 | 131.0 |

The exceptionally dry season resulted in a poor crop of soyas; ground-nuts were not affected to the same extent. All four varieties of ground-nuts have yielded a greater weight per acre of both oil and protein than any of the soya bean strains. The leading ground-nut variety, Spanish Bunch, has produced four times the yield of oil and 50 per cent. more protein than Hernon No. 273, the most successful soya strain this year. This season's results are overwhelmingly in favour of ground-nuts, but the considerable labour requirements of this crop, when compared with the ease of harvesting soyas by combine, is a point to be considered.

### Soya Bean Distance Planting Trial

**Object.** To compare the yields of soya beans at different distances of planting.

**Distances of Planting.**

A = 2′ x 4″
B = 2½′ x 3¼″
C = 3′ x 3″

**Strains.**

1. Hernon No. 237—hay strain
2. Hernon No. 279—grain strain

**Design.** Randomised blocks will split plots. 4 Replications.

**Manurial Dressing.** No fertiliser. On land following maize.

**Date of Planting.** 29/12/48.

**Yields of grain (in bags of 200 lbs. nett per acre)**

| Strain | Spacing | | | Mean |
|---|---|---|---|---|
| | 2′ x 4″ | 2½′ x 3¼″ | 3′ x 3″ | |
| No. 237 | 5.21 | 4.88 | 5.01 | 5.03 |
| No. 279 | 6.09 | 6.35 | 5.94 | 6.13 |
| Mean | 5.65 | 5.61 | 5.47 | 5.58 |

**Significance.** Differences between yields of strains are significant, but not spacings.

Significant difference for strains = .07 b.p.a.

**Conclusions.** Strain No. 279 has outyielded No. 237, which is really a hay variety, by a little over a bag an acre.

Although the differences between the mean yields of the two strains at the various planting distances is small, being less than .2 bags per acre, it has proved almost significant. The slight increase in number of plants to the acre has enabled the rather closer spacings to give a little higher yield.

## Sunflower Variety Trial

**Object.** To compare the yields of varieties of sunflowers.

**Varieties.**

(1) Mars
(2) Pole Star
(3) Southern Cross
(4) Jupiter

**Design.** Randomised blocks. 5 Replications.

**Planting Distance.** 2′ x 7½″.

**Manurial Dressing.** No manure or fertiliser. On land following velvet beans grown for seed.

**Date of Planting.** 3/1/49.

**Harvested.** 20-30/4/49.

| Variety | Colour | Yield per acre (in bags of 125 lbs. nett) | Ether Extract % | | Order of Maturity |
|---|---|---|---|---|---|
| | | | As sampled | 100% D.M. | |
| Pole Star | Grey striped | 9.9 | 26.8 | 28.6 | 1. Earliest |
| Jupiter | Black | 8.6 | 29.9 | 31.8 | 2. |
| Mars | Black | 11.7 | 25.2 | 27.1 | 3. |
| Southern Cross | Grey striped | 9.4 | 28.8 | 30.7 | 4. Latest |

**Significant Difference.** 1.3 bags per acre.

**Conclusions.** Mars has significantly outyielded the other three varieties, but has the lowest oil content.

The ripening heads suffered considerable damage from bird attack. Pole Star, the earliest ripening, probably suffered rather more in this respect.

Plots of these sunflowers were successfully reaped with a combine harvestor on the Government farm, Gwebi.

# Southern Rhodesia Veterinary Report

DECEMBER, 1949

**General.** Good rains fell in all Districts with resulting improvement in the water position, in grazing, and in the condition of cattle.

**Tick Life.** Tick Life was reported to be increasingly active. The following quarantine notices were issued during the month: Salisbury, 7; Umtali, 4; and Fort Victoria, 1.

## SCHEDULED DISEASES:

1. **African Coast Fever.** No further cases occurred in the Salisbury District.

2. **Theileriosis.** Urungwe Reserve in the Salisbury District is still in quarantine. 1 case in each of the following Districts was reported: Bulawayo (Plumtree Commonage); Gwelo and Melsetter.

3. **Anthrax.** Nil.

4. **Foot and Mouth Disease.** Nil.

5. **Glanders or Farcy.** Nil.

6. **Heartwater.** Cases were reported in the Bulawayo District.

7. **Lungsickness (Contagious Pleuro Pneumonia of Cattle).** Nil.

8. **Mange in Horses, Mules, Donkeys and Camels.** Nil.

9. **Pyaemia or Epizootic Lymphangitis.** Nil.

10. **Redwater.** Cases were reported in the following Districts: Salisbury, 7; Bulawayo, 2; Fort Victoria, 2; Melsetter, 25.

11. **Rinderpest.** Nil.

12. **Swine Erysipelas.** Nil.

13. **Swine Fever.** Nil.

14. **Quarter Evil.** 5 cases occurred in the Bulawayo District; and 1 in the Melsetter District.

15. **Tuberculosis.** Nil.

16. **Scab.** Nil.

17. **Rabies.** Nil.

18. **Senkobo Disease.** Nil.

19. **Trypanosomiasis.** 19 cases were reported in the Chipinga District.

20. **Contagious Epididymitis and Vaginitis (Epi-Vag).** Only 1 new case was reported in Salisbury District. On existing centres, Bulawayo reports that a number of the herds are clearing up, and owing to Artificial Insemination no spread is occurring amongst the cattle in the herds. A similar clearing up has been noticed in a herd in Fort Victoria District, where a bull which is running with the herd has not become infected.

21. **Lumpy Skin Disease.** A few mild cases occurred in the Gwelo District.

22. **Contagious Abortion.** Was confirmed in the Bulawayo, Gwelo, Fort Victoria and Melsetter Districts.

## SCHEDULED POULTRY DISEASES:

23. **Spirachaetosis.** Nil.

24. **Coccidiosis.** Nil.

25. **Fowl Typhoid.** Nil.

26. **Bacillary White Diarrhoea.** Nil.

27. **Tuberculosis,** Nil.

28. **Chicken Pox and Roup.** Nil.

## OTHER DISEASES:

29. **Gallsickness.** Cases were reported in the following Districts: Salisbury, 9; Bulawayo, 5; Umtali, 3; Fort Victoria, 1; Melsetter, 5; and a number in the Gwelo District.

30. **Paratyphoid.** Was diagnosed in the Fort Victoria District.

31. **Geilsiekte.** Nil.

32. **Horse Sickness.** Nil.

33. **Biliary.** 1 case occurred in the Fort Victoria District.

34. **Sweating Sickness.** Was reported in the Bulawayo, Gwelo and Fort Victoria Districts.

35. **Opthalmia.** Prevalent in all Districts with the exception of Umtali.

36. **Screw worm.** Was prevalent in the Salisbury, Bulawayo and Melsetter Districts with a few cases in the Gwelo and Fort Victoria Districts.

37. **Coccidiosis.** Nil.

38. **Spirachaetosis.** 1 death in the Melsetter District.

### POISONING:

39. **Veld Poisoning.** Cases in all Districts with the exception of Umtali.

40. **Mineral Poisoning.** The following deaths from Arsenical Poisoning were reported: Salisbury, 5; Gwelo, 4; Fort Victoria, 10; Melsetter, 4. In the Salisbury District 50 pigs died as the result of Mercurial Poisoning and 6 animals from Nitrate Poisoning.

**Mallein Testing.** In December, 1949: 8 Mares, and 28 Geldings were tested. All passed.

**Tuberculin Testing.** In December, 1949: 5 Bulls, 5 Cows, and 31 Heifers were tested. All passed.

### IMPORTATIONS:

**Union of South Africa.** 12 Bulls (Breeding); 54 Cows and Calves; 8 Horses and Mares; 30 Geldings.

**United Kingdom.** 5 Pigs (Breeding).

**Bechuanaland Protectorate.** 88 Sheep (Slaughter); 163 Goats (Slaughter); 2,981 Oxen (Slaughter); 55 Bulls (Slaughter); 314 Cows and Calves.

### EXPORTATIONS:

**Nyasaland.** 5 Bulls (Breeding).

**Northern Rhodesia.** 1 Bull (Breeding).

**Portuguese East Africa.** 90 Oxen (Slaughter); 19 Calves and Cows.

### EXPORTATIONS—MISCELLANEOUS:

**In Cold Storage:**

**Belgian Congo.** 14,414 lbs. Offal; 7,987 lbs. Poultry; 1,904 lbs. Cooked Meats; 4.512 lbs. Bacon and Ham.

**Northern Rhodesia.** 37,715 lbs. Bacon and Ham.

**Union of South Africa.** 9,026 lbs. Casings.

**Bechuanaland Protectorate.** 603 lbs. Bacon and Ham.

**Meat Products from Liebigs (Rhodesia) Ltd., West Nicholson:**

**Union of South Africa.** 2,304 lbs. Corned Beef; 5,400 lbs. Oxford Sausage; 13,200 lbs. Vienna Sausage; 236 lbs. Liver Roll; 3,600 lbs. Curried Beef; 1,274 lbs. Potted Beef; 4,776 lbs. Steak and Kidney; 2,328 lbs. Braised Steak and Onions.

J. S. ADAMSON,
Acting Director of Veterinary Services.

## JANUARY, 1950

**General.** Good rains have fallen in the Salisbury District, and the water position, grazing and condition of cattle showed further improvement. In the remaining Districts rain was badly needed with resulting deterioration in the water position, grazing and condition of cattle.

**Tick Life.** Tick Life was reported to be very active in all Districts. The following quarantine notices were issued during the month: Salisbury, 9; Umtali, 3; Gwelo, 2; Fort Victoria, 1.

### SCHEDULED DISEASES:

1. **African Coast Fever.** No further cases occurred in the Salisbury District.

2. **Theileriosis.** Urungwe Reserve in the Salisbury District, and Plumtree Commonage in the Bulawayo District are still in quarantine. 4 deaths occurred in the Melsetter District.

3. **Anthrax.** 3 deaths occurred in the Belingwe Reserve, Bulawayo District. All cattle in the Belingwe Reserve will be inoculated.

4. **Foot and Mouth Disease.** Nil.

5. **Glanders or Farcy.** Nil.

6. **Heartwater.** 2 cases were confirmed in the Bulawayo District.

7. **Lungsickness (Contagious Pleuro Pneumonia of Cattle).** Nil.

8. **Mange in Horses, Mules, Donkeys and Camels.** Nil.

9. **Pyaemia or Epizootic Lymphangitis.** Nil.

10. **Redwater.** Cases were reported in all Districts as follows: Salisbury, 12; Bulawayo, 6; Umtali, 5; Gwelo, 1; Fort Victoria, 2; Melsetter, 9.

11. **Rinderpest.** Nil.

12. **Swine Erysipelas.** 1 death occurred in the Salisbury District.

13. **Swine Fever.** Nil.

14. **Quarter Evil.** Cases were reported in the Salisbury, Bulawayo, Fort Victoria and Melsetter Districts.

15. **Tuberculosis.** Nil.

16. **Scab.** Nil.

17. **Rabies.** Nil.

18. **Senkobo Disease. Nil.**

19. **Trypanosomiasis.** 4 cases were reported in the Mkoto Reserve, Salisbury District; and 25 cases in the Chipinga District.

20. **Contagious Epididymitis and Vaginitis (Epi-Vag).** 4 new centres of the disease were discovered during January. 1 in Salisbury, Veterinary District, 2 in Fort Victoria, and 1 in Bulawayo. As a result of extensive inspections carried out on infected herds during the past two months, a number of farms have now been released. The control measures applied to Bulls appears to be giving results in reducing the spread of the disease.

21. **Lumpy Skin Disease.** Nil.

22. **Contagious Abortion.** 5 cases occurred in the Gwelo District.

## SCHEDULED POULTRY DISEASES:

23. **Spirachaetosis.** Nil.

24. **Coccidiosis.** Nil.

25. **Fowl Typhoid.** Nil.

26. **Bacillary White Diarrhoea.** Nil.

27. **Tuberculosis.** Nil.

28. **Chicken Pox and Roup.** Nil.

## OTHER DISEASES:

29. **Gallsickness.** Numerous cases in all Districts.

30. **Paratyphoid.** Nil.

31. **Geilsiekte.** Nil.

32. **Horse Sickness.** 1 case was reported in the Salisbury District.

33. **Biliary.** Nil.

34. **Sweating Sickness.** Cases occurred in all Districts with the exception of Umtali District.

35. **Opthalmia.** Prevalent in all Districts with the exception of Umtali.

36. **Screw Worm.** Was reported in all Districts with the exception of Salisbury and Umtali.

37. **Coccidiosis.** Was successfully treated in the Melsetter District.

38. **Internal Parasites.** Was reported in weaner stock in the Chipinga District.

## POISONING:

39. **Veld Poisoning.** Cases were reported in the Salisbury, Gwelo and Melsetter Districts.

40. **Mineral Poisoning.** Deaths occurred in the following Districts: Salisbury, 5 Arsenical, 9, Cyanide, 3 Sodium Nitrate; Bulawayo, 5 Arsenical.

**Mallein Testing.** In January, 1950: 25 Horses and 22 Donkeys. were tested. All passed.

**Tuberculin Testing.** In January, 1950: 13 Bulls, 31 Cows, 52 Heifers and 12 Yearlings were tested, and all passed.

## IMPORTATIONS:

**Union of South Africa.** 8 Bulls (Breeding); 60 Cows and Calves (Breeding); 6 Horses and Mares; 13 Geldings; 12 Sheep (Breeding).

**Northern Rhodesia.** 1 Horse and Mare.

**Basutoland.** 4 Geldings.

**Bechuanaland Protectorate.** 1,165 Oxen (Slaughter); 16 Cows (Slaughter); 9 Bulls (Slaughter); 284 Sheep (Slaughter); 60 Goats (Slaughter).

## EXPORTATIONS:

**Portuguese East Africa.** 1 Bull Breeding); 60 Cows and Calves (Breeding); 152 Oxen (Slaughter); 1 Bull (Slaughter); 7 Cows (Slaughter); 3 Pigs (Breeding).

**Nyasaland.** 1 Bull (Breeding).

**Union of South Africa.** 4 Pigs (Breeding); and 9 Geldings.

**Northern Rhodesia.** 1 Pig (Breeding); and 22 Donkeys.

**Belgian Congo.** 13 Pigs (Breeding); and 2 Geldings.

## EXPORTATIONS—MISCELLANEOUS:

**In Cold Storage:**

**Union of South Africa.** 15,925 lbs. Sausage casings.

**Northern Rhodesia.** 23,309 lbs. Bacon and Ham.

**Belgian Congo.** 9,055 lbs. Beef; 15,708 lbs. Offal; 1,445 lbs. Gammon.

**Bechuanaland Protectorate.** 79 lbs. Bacon and Ham.

**Meat Products from Liebigs (Rhodesia) Ltd., West Nicholson:**

**Union of South Africa.** 4,500 lbs. Oxford Sausages; 788 lbs. Liver Roll; 2,424 lbs. Curried Beef.

J. S. ADAMSON,
Acting Director of Veterinary Services.

# Eighteenth Annual Milking Competition

The Southern Rhodesian Annual Milking Competition which has been held for the past eighteen years is open to all farmers whose herds are tested under the Government Milk Recording Scheme, other than those who produce cream for farm-butter puropses.

This Competition is, as before, divided into two sections, with a floating trophy for the winner in each section. The results of the Competition are calculated on the average production of the best fifteen cows in the herd, and the trophies are presented for:

(a) The highest average milk production;

(b) The highest average butterfat production.

The winner of Competition "A" was Mrs. M. Parsons, "Weltevrede Dairy," Bulawayo, with an average milk production of 12.933.1 lbs., while the second place was taken by Mr. J. Jamieson, "Criterion Dairy," Bulawayo, and the third by Messrs. G. J. Franklin & Son, "Alphaeton," Umtali, with averages of 12,583.7 lbs., and 11,303.8 lbs., respectively.

These producers are to be heartily congratulated on the performance of their herds as are the next eight in order of merit who produced an average of over 10,000 lbs. of milk each; this being no mean achievement during one of the worst droughts ever experienced in Southern Rhodesia.

Competition "B" was won by Messrs. G. J. Franklin & Son, "Alphaeton," Umtali, with an average production of 443.3 lbs. butterfat; while Mr. J. Jamieson, "Criterion Dairy," Bulawayo, and Mrs. M. Parsons, "Weltevrede Dairy," Bulawayo, were close runners-up with averages of 418.9 lbs. and 409.5 lbs. butterfat, respectively. These producers are to be warmly congratulated on their results, which demonstrate that there are herds in this Colony which can, and do, produce results favourably comparable to those in other more favoured dairying countries.

The full results of the two Competitions are as follows:

**Competition "A."** (For the fifteen cows with the highest average milk production in a lactation period not exceeding 300 days):—

| | lbs. |
|---|---|
| 1st—Mrs. M. Parsons, "Weltevrede Dairy," P.O. Box 7, Bulawayo. (Average production of milk per cow) | 12,933.1 |

| | |
|---|---|
| 2nd—J. Jamieson, Esq., " Criterion Dairy," P.O. Box 217, Bulawayo. (Average production of milk per cow) | 12,583.7 |
| 3rd—Messrs. G. J. Franklin & Son, "Alphaeton," P.O. Box 105, Umtali. (Average production of milk per cow) | 11.303.8 |

**Competition "B."** (For the fifteen cows with the highest average butterfat production in a lactation period not exceeding 300 days):—

| | lbs. |
|---|---|
| 1st—Messrs. G. J. Franklin & Son, "Alphaeton," P.O. Box 105, Umtali. (Average production of butterfat per cow) | 443.3 |
| 2nd—J. Jamieson, Esq., " Criterion Dairy," P.O. Box 217, Bulawayo. (Average production of butterfat per cow) | 418.9 |
| 3rd—Mrs. M. Parsons, " Weltevrede Dairy," P.O. Box 7, Bulawayo. (Average production of butterfat per cow) | 409.5 |

# HERD AVERAGES, 1948-49

These averages are for cows which completed a lactation not exceeding 300 days during the period 1.10.48 to 30.9.49. The records of cows which died or were sold before completing 200 days, or which were withdrawn from test by permission of the Chief Dairy Officer, are not included. Averages are not given also for those herds in which the number of cows completing a lactation during this period was less than five.

## OFFICIAL MILK RECORDS.

| Owner's Name and Address. | Breed. | Milk Lbs. | B. Fat Lbs. | B. Fat % | Days | No. of Cows. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Under 2 years | 2 years old | Junior 3 years | Senior 3 years | Junior 4 years | Senior 4 years | Mature | Total |
| Jamieson, J., Bulawayo | Friesland | 10734.7 | 377.1 | 3.54 | 300 | — | 4 | 1 | — | 2 | 1 | 3 | 11 |
| Robertson Syndicate, Bulawayo | Friesland | 9302.6 | 307.0 | 3.30 | 292 | — | — | 1 | 1 | 1 | 2 | 4 | 9 |
| Sharp, Major R. R., Redbank, Bulawayo | Friesland | 8368.5 | 291.2 | 3.48 | 295 | — | 8 | 3 | 6 | 1 | 6 | 16 | 40 |
| Government Expt. Station, Matopos | Red Poll | 7521.4 | 275.8 | 3.67 | 284 | — | — | 5 | 1 | 2 | 5 | 10 | 23 |
| Pascoe, T. C., Salisbury | Friesland | 6793.0 | 233.6 | 3.42 | 300 | — | 3 | 1 | 1 | — | — | 11 | 16 |
| Rodger, D. L., Bulawayo | Jersey | 6374.1 | 329.4 | 5.17 | 300 | 1 | 4 | — | — | — | 1 | — | 6 |
| Meikles Trust & Invest Co., Ltd., Shangani | Friesland | 6363.2 | 219.6 | 3.46 | 244 | — | — | — | — | 2 | — | 4 | 6 |
| Gelman, S., Bulawayo | Jersey | 6345.7 | 302.0 | 4.76 | 298 | 1 | 1 | 3 | 5 | 2 | — | — | 12 |
| Hards & Liddle, Marandellas | Guernsey | 5317.8 | 261.9 | 4.92 | 275 | — | — | — | 1 | 3 | — | 7 | 11 |
| Keightley, J. H., Glendale | Jersey | 4649.2 | 242.6 | 5.22 | 276 | 2 | 2 | 1 | 5 | 1 | 1 | 2 | 14 |

Averages—

| | |
|---|---|
| Milk, lbs. | 7394.5 |
| Butter Fat, lbs. | 282.7 |
| Average Butter Fat | 3.82% |
| Days | 295 |
| Completed lactations | 148 |

# 18th Annual Milking Competition

## 1st October, 1948 - 30th September, 1949

### COMPETITION "A"

### MILK

| *Name.* | *Address.* | *Average Lbs. Milk.* |
|---|---|---|
| 1st—Parsons, Mrs. M. | Bulawayo | 12933.1 |
| 2nd—Jamieson, J. | Bulawayo | 12583.7 |
| 3rd—Franklin & Son, G. J. | Umtali | 11303.8 |
| Sharp, Major R. R. | Redbank | 11190.5 |
| Bickle, A. L. | Bulawayo | 11172.7 |
| Meikle, T. Trust and Investment | Shangani | 10760.9 |
| Grasslands Expt. Station | Marandellas | 10564.0 |
| Kabot, D. S. | Bulawayo | 10557.3 |
| Fischer, R. le S. | Headlands | 10472.3 |
| Tapson, E., Trust, Ltd. | Rusape | 10421.9 |
| Govt. Demon. Farm (Umshandige) | Fort Victoria | 10313.8 |
| Allan, D. A. | Salisbury | 9787.7 |
| Kew, B. H. | Bulawayo | 9455.0 |
| Huddy, D. J. | Salisbury South | 9413.0 |
| Gibbs, Hon. H. V. | Redbank | 9316.4 |
| Baxter, J. A. | Salisbury South | 9206.5 |
| Govt. Expt. Station (Matopos) | Matopos | 9195.0 |
| Waldschutz, R. O. | Marandellas | 9150.0 |
| Morrisby, F. B. | Gwelo | 9050.9 |
| Palmer, Estcourt | Penhalonga | 8998.7 |
| Downs, B. St. J. D. | Guinea Fowl | 8941.0 |
| Freeland, P. | Gwelo | 8928.0 |
| Norvall, K. | Bulawayo | 8896.6 |
| Cross & Son | Bulawayo | 8708.2 |
| Robertson, D., Synd., Ltd. | Bulawayo | 8686.3 |
| Scutt, W. F. | Norton | 8436.1 |
| McLean, L. | Guinea Fowl | 8362.3 |
| Jackson-Clark, Mrs. R. | Gwelo | 8267.9 |
| McCay, J. U. | Bulawayo | 8249.5 |
| Fischer, W. F. | Headlands | 8237.8 |
| Allan, Mrs. M. | Salisbury | 8191.0 |
| Barry, F. J. | Old Umtali | 8173.9 |
| Harley, D. A. | Beatrice | 8172.5 |
| Whitehead, N. W. | Matopos | 8083.2 |
| Pascoe, T. C. | Salisbury | 8076.0 |
| Swaine, H. | Gwelo | 8074.3 |
| Govt. Demon. Farm | Gwebi | 8030.1 |
| Edward & Sons, Ltd., J. R. | Shangani | 7895.2 |
| Huddy, L. | Salisbury South | 7880.8 |
| Ballantyne, R. A. | Salisbury | 7876.2 |
| Susman & Newfield | Enterprise | 7736.3 |
| Fischer, Mrs. H. C. | Headlands | 7712.5 |
| Boyd-Clark, C. | Inyazura | 7615.9 |

| *Name.* | *Address.* | *Average Lbs. Milk.* |
|---|---|---|
| McLean, J. H. | Gwelo | 7567.0 |
| Gelman, S. | Bulawayo | 7400.6 |
| Bradley Bros. | Bulawayo | 7318.6 |
| Duff, J. N. | Marandellas | 7277.9 |
| Robinson, G. W. | Salisbury | 7189.1 |
| King, D. | Concession | 7119.7 |
| Linton, P. | Salisbury South | 7095.1 |
| Everard, Mrs. M. | Inyazura | 7014.8 |
| Gebbie, W. N. | Tatagura | 6995.0 |
| Anderson, I. D. H. | Fort Victoria | 6944.6 |
| Morris, G. R. | Salisbury South | 6919.3 |
| Forrester, F. W. | Marandellas | 6890.5 |
| Dobson, A. B. | Norton | 6881.7 |
| Huddy, Mrs. M. R. | Salisbury South | 6767.5 |
| Futter, G. G. | Gwelo | 6755.4 |
| Burras, M. W. | Bulawayo | 6752.0 |
| Brereton, Miss N. | Gwelo | 6737.2 |
| Lay, H. T. | Baddeley | 6736.8 |
| Taylor, L. | Selukwe | 6736.2 |
| Anderson, G. R. | Gwelo | 6714.7 |
| Red Valley Estate | Marandellas | 6709.8 |
| Moore, S. | Salisbury South | 6682.9 |
| Maynard, Lt.-Col. C. I. F. | Melfort | 6672.6 |
| Barrett, N. G. | Rusape | 6666.9 |
| Cumming, J. | Norton | 6482.7 |
| Brucehame Dairy | Fort Victoria | 6464.0 |
| MacIlwaine, J. N. L. | Marandellas | 6441.7 |
| Bickley, K., Late | Heany Junction | 6421.2 |
| Thurlow, J. G. | Bindura | 6284.4 |
| Marshall, D. W. | Old Umtali | 6273.5 |
| Barry, J. H. | Old Umtali | 6242.0 |
| Mitchell, C. F. | Essexvale | 6235.4 |
| Dold, J. B. | Salisbury South | 6138.6 |
| Morant, Commander E. L. | Salisbury South | 6136.1 |
| Green, E. E. C. | Bulawayo | 6131.0 |
| Black, Mrs. M. | Bindura | 6124.8 |
| Cary, L. E. O. | Trelawney | 6116.0 |
| Rhodesia Corporation, Ltd. | Norton | 6016.4 |
| Krahner, Mrs. M. M. | Banket | 6001.2 |
| Timms, P. S. | Rusape | 5968.9 |
| Salvation Army | Salisbury | 5858.6 |
| Hughes, J. A. G. | Goromonzi | 5856.9 |
| Stanger, E. | Rusape | 5845.7 |
| Huggins, Sir G. M. | Enterprise | 5719.4 |
| Mungle, J. T. | Odzi | 5719.4 |
| Brooke, Colonel P. A. | Borrowdale | 5682.4 |
| Fleming, G. N. | Salisbury South | 5673.3 |
| Parkes, Mrs. E. L. | Goromonzi | 5666.6 |
| Kingston Farm Syndicate | Bindura | 5631.0 |
| Christo, O. L. | Gwelo | 5479.3 |
| Bredenkamp, J. B. | Ruwa | 5459.5 |
| James, Mrs. Y. V. Russell | Golden Valley | 5303.8 |
| Hards & Liddle | Marandellas | 5290.7 |
| Stockil, R. O. | Fort Victoria | 4884.0 |
| Miles, Estate B. L. | Banket | 4826.0 |
| Valentine, G. W. | Odzi | 4772.8 |
| Bowan, P. A. | Salisbury South | 4672.1 |
| Mutumbara Mission | Mutumbara | 4559.4 |
| Sinclair, S. M. | Melsetter | 4514.8 |
| Haywood, Mrs. W. D. | Gatooma | 4292.3 |
| Waddilove Training Institute | Marandellas | 4212.5 |
| Bowyer, R. J. | Theydon | 4209.1 |
| Gebhardt, G. F. | Gwelo | 4159.4 |
| Mitchell, Misses I and J. | Odzi | 4154.9 |
| Simpson, K. M. | Enterprise | 4153.4 |
| Valentine, A. F. H. | Umtali | 3827.4 |
| Coke-Norris, H. A. | Old Umtali | 3809.6 |
| Marshall, C. J. | Melsetter | 3467.4 |
| Miller, H. F. | Lalapansi | 3356.3 |

# 18th Annual Milking Competition

## 1st October, 1948 - 30th September, 1950

### COMPETITION "B"

### BUTTERFAT

| *Name.* | *Address.* | *Average Lbs. Butterfat.* |
|---|---|---|
| 1st—Franklin & Son, G. J. | Umtali | 443.3 |
| 2nd—Jamieson, J. | Bulawayo | 418.9 |
| 3rd—Parsons, Mrs. M. | Bulawayo | 409.5 |
| Tapson, Evelyn Trust, Ltd. | Rusape | 378.8 |
| Sharp, Major R. R. | Redbank, Bulawayo | 377.1 |
| Govt. Demon. Farm (Umshandige) | Fort Victoria | 375.2 |
| Meikles Trust & Invest. Co., T. | Shangani | 372.4 |
| Grasslands Expt. Station | Marandellas | 371.1 |
| Bickle, A. L. | Bulawayo | 365.7 |
| Fischer, R. le S. | Headlands | 362.4 |
| Downs, B. St. J. D. | Guinea Fowl | 359.6 |
| Kabot, D. S. | Bulawayo | 364.5 |
| Palmer, Estcourt | Penhalonga | 342.3 |
| Kew, B. H. | Bulawayo | 339.9 |
| Huddy, D. J. | Salisbury South | 338.8 |
| Govt. Experiment Station | Matopos | 338.3 |
| Harley, D. A. | Beatrice | 334.2 |
| Allan, D. A. | Salisbury | 326.1 |
| Baxter, J. A. | Salisbury South | 323.7 |
| Freeland, P. | Gwelo | 316.9 |
| Clarke, R. Jackson (Mrs.) | Gwelo | 316.7 |
| Waldschutz, R. O. | Marandellas | 316.3 |
| McLean, L. | Guinea Fowl | 312.7 |
| Gelman, S. | Bulawayo | 312.2 |
| Barry, F. J. | Old Umtali | 311.8 |
| Fischer, W. F. | Headlands | 309.9 |
| Scutt, W. F. H. | Norton | 309.9 |
| Gibbs, Hon. H. V. | Redbank, Bulawayo | 307.1 |
| Norvall, K. | Bulawayo | 305.8 |
| Maynard, Lieut.-Col. C. I. F. | Melfort | 303.3 |
| Whitehead, N. W. | Matopos | 299.1 |
| Stewart & Sons, Ltd., J. R. | Shangani | 295.6 |
| Morrisby, F. B. | Gwelo | 294.9 |
| Cross & Son | Bulawayo | 291.7 |
| Robertson Syndicate, Ltd. | Bulawayo | 289.7 |
| Ballantyne, R. A. | Salisbury | 285.3 |
| Parkes, Mrs. E. L. | Goromonzi | 284.4 |
| McLean, J. H. | Gwelo | 284.3 |
| Huddy, L. | Salisbury South | 283.5 |
| McCay, J. U. | Bulawayo | 280.3 |
| Duff, J. N. | Marandellas | 280.1 |
| Swaine, H. | Gwelo | 277.9 |
| Pascoe, T. C. | Salisbury | 276.3 |

| *Name.* | *Address.* | *Average Lbs. Butterfat.* |
|---|---|---|
| Allan, Mrs. M. | Salisbury | 275.3 |
| Huddy, Mrs. M. R. | Salisbury South | 273.1 |
| Fischer, Mrs. H. C. | Headlands | 269.9 |
| Hards & Liddle | Marandellas | 265.7 |
| Gebbie, W. N. | Tatagura | 264.3 |
| Linton, P. | Salisbury South | 263.2 |
| Boyd-Clark, C. | Inyazura | 263.1 |
| Futter, G. G. | Gwelo | 262.4 |
| Everard, Mrs. M. | Inyazura | 261.5 |
| Brereton, Miss N. | Gwelo | 261.2 |
| Govt. Demonstration Farm | Gwebi | 261.0 |
| Robinson, G. W. | Salisbury | 260.8 |
| Taylor, L. | Selukwe | 259.0 |
| Dobson, A. B. | Norton | 257.9 |
| Susman & Newfield | Enterprise | 257.6 |
| Morris, G. R. | Salisbury South | 255.7 |
| Bickley, Late K. | Heany Junction | 255.0 |
| Barry, J. H. | Old Umtali | 254.3 |
| Bradley Bros. | Bulawayo | 252.6 |
| Lay, H. T. | Baddeley | 250.2 |
| Cumming, John | Norton | 249.6 |
| Burras, N. W. | Bulawayo | 247.0 |
| Red Valley Estate | Marandellas | 246.1 |
| King, D. | Concession | 245.1 |
| Morant, Commander E. L. | Salisbury South | 244.3 |
| Barrett, N. G. | Rusape | 244.2 |
| Forrester, F. W. | Marandellas | 241.4 |
| Marshall, D. W. | Old Umtali | 240.3 |
| Bredenkamp, J. D. | Ruwa | 238.1 |
| Anderson, G. R. | Gwelo | 237.8 |
| Mungle, J. T. | Odzi | 237.2 |
| Mitchell, C. F. | Essexvale | 236.3 |
| Stanger, E. | Rusape | 236.0 |
| MacIlwaine, J. N. L. | Marandellas | 235.6 |
| Moore, S. | Salisbury South | 235.2 |
| Anderson, I. D. H. | Fort Victoria | 234.9 |
| Brucehame Dairy | Fort Victoria | 233.0 |
| Thurlow, J. G. | Bindura | 232.5 |
| Timms, P. S. | Rusape | 226.2 |
| Salvation Army | Salisbury | 224.3 |
| Krahner, Mrs. M. M. | Banket | 224.2 |
| Cary, L. E. O. | Trelawney | 224.1 |
| Black, Mrs. M. | Bindura | 221.8 |
| Green, E. E. C. (Kloof Farm) | Bulawayo | 219.8 |
| Rhodesia Corporation, Ltd. | Norton | 218.1 |
| Dold, J. B. | Salisbury South | 216.9 |
| Hughes, J. A. G. | Goromonzi | 216.9 |
| Fleming, G. N. | Salisbury South | 215 3 |
| Kingston Farm Syndicate | Bindura | 209.2 |
| Huggins, Sir G. M. | Enterprise | 205.1 |
| Brook, Colonel P. A. | Borrowdale | 199.3 |
| Miles, Estate B. L. | Banket | 198.5 |
| Valentine, G. W. | Odzi | 197.1 |
| Christo, O. L. | Gwelo | 196.4 |
| James, Mrs. Y. V. Russell | Golden Valley | 195.9 |
| Sinclair, S. M. | Melsetter | 194.8 |
| Bowen, P. A. | Salisbury South | 191.3 |
| Mitchell, Misses I. and J., | Odzi | 178.9 |
| Bowyer, R. J. | Theydon | 174.7 |
| Valentine, A. F. H. | Umtali | 173.5 |
| Haywood, Mrs. W. D. | Gatooma | 169.5 |
| Mutumbara Mission | Mutumbara | 167.9 |
| Stockil, R. O. | Fort Victoria | 166.6 |
| Simpson, K. M. | Enterprise | 160.7 |
| Coke-Norris, H. A. | Old Umtali | 160.4 |
| Waddilove Training Institute | Marandellas | 159 4 |
| Gebhardt, G. F. | Gwelo | 154.6 |
| Miller, H. F. | Lalapanzi | 136 3 |
| Marshall, C. J. | Melsetter | 122.5 |

## SEMI-OFFICIAL HERD AVERAGES, 1948-49

| Name. | Breed. | Milk. Lbs. | % B. Fat | B. Fat, Lbs. | Days. | Cows. |
|---|---|---|---|---|---|---|
| J. Jamieson, Bulawayo | G. Friesland | 11054.3 | 3.28 | 362.2 | 297 | 19 |
| Parsons, Mrs. M., Bulawayo | G. Friesland | 10552.7 | 3.07 | 324.3 | 296 | 46 |
| Grasslands Experiment Station, Marandellas | G. Friesland | 9037.4 | 3.54 | 319.8 | 291 | 27 |
| Butler, Ed., Shamva | P.B. & G. Friesland | 8347.7 | 3.70 | 310.1 | 292 | 6 |
| Morkel, C. F. S., Macheke | G. Friesland | 7585.1 | 4.01 | 304.6 | 289 | 8 |
| Franklin & Son, G. J., Umtali | G. Friesland | 7545.0 | 4.02 | 303.8 | 285 | 101 |
|  | G. Guernsey & Shorthorn | 8142.1 | 3.63 | 296.0 | 284 | 51 |
| Govt. Dem. Farm, Umshandige, Fort Victoria | G. Friesland | 7735.4 | 3.80 | 294.5 | 268 | 8 |
| Edwards, R. I., Chipinga | G. Friesland | 6443.7 | 4.56 | 294.0 | 273 | 16 |
| Maynard, Lt.-Col. C. I. F., Melfort | G. Jersey & Red Poll | 8498.0 | 3.41 | 288.3 | 291 | 78 |
| Bickle, A. L. Bulawayo | P.B. & G. Friesland | 7669.7 | 3.76 | 288.2 | 272 | 8 |
| Danckwerts, J. V., Salisbury | G. Friesland | 7719.0 | 3.72 | 287.3 | 290 | 64 |
| Tapson Trust, E., Rusape | G. Friesland | 7725.7 | 3.60 | 277.8 | 297 | 37 |
| Kew, B. H., Bulawayo | G. Friesland | 7245.5 | 3.82 | 277.0 | 288 | 23 |
| Clark, Mrs. R. Jackson, Gwelo | G. Friesland |  |  |  |  |  |
| Parkes, Mrs. E. L., Goromonzi | P.B. & G. Jersey | 5490.3 | 4.98 | 273.4 | 276 | 15 |
| Gelman, S., Bulawayo | G. Friesland | 7973.3 | 3.37 | 269.0 | 286 | 6 |
| Palmer, Escourt, Penhalonga | G. Friesland & G. Shorthorn | 6820.6 | 3.90 | 267.4 | 260 | 48 |
| Allan, D. A., Salisbury | G. Friesland | 7926.6 | 3.36 | 266.0 | 288 | 52 |
| Kabot, D. S., Bulawayo | G. Friesland | 7474.2 | 3.55 | 265.6 | 294 | 55 |
| Bothashof School, Salisbury | G. Friesland | 7494.6 | 3.54 | 265.5 | 300 | 7 |
| Cousins, T., Gwelo | G. Friesland | 7468.8 | 3.54 | 264.6 | 268 | 9 |
| Barry, F. J., Umtali | G. Shorthorn & G. Friesland | 6765.4 | 3.90 | 264.0 | 291 | 32 |
| Harley, D. A. | G. Guernsey & G. Ayrshire | 6336.1 | 4.08 | 258.9 | 292 | 112 |
| Stewart & Sons, Ltd., J. R., Shangani | P.G. & G. Ayrshire | 6743.0 | 3.83 | 258.7 | 284 | 37 |
| Scutt, W. F. H., Norton | G. Friesland | 6917.0 | 3.69 | 255.1 | 292 | 42 |
| Fischer, R. le S., Headlands | G. Friesland | 7300.7 | 3.47 | 253.2 | 270 | 76 |
| Whitehead, N. W., Matopos | G. Friesland |  |  |  |  |  |
|  | G. South Devon & G. Red Poll | 6793.9 | 3.73 | 253.2 | 288 | 28 |
| Baxter, J. A., Salisbury | P.B. & G. Friesland | 7173.7 | 3.52 | 252.4 | 293 | 67 |
| Waldschutz, R. O., Marandellas | G. Friesland | 2773.9 | 3.48 | 252.2 | 283 | 45 |
| Knill, H. A., Marandellas | G. Friesland | 6645.8 | 3.79 | 252.2 | 297 | 13 |
| B.S.A. Company, Mazoe | G. Friesland | 7570.5 | 3.30 | 250.3 | 290 | 12 |

## SEMI-OFFICIAL HERD AVERAGES, 1948-49—(Continued)

| Name. | Breed. | Milk, Lbs. | % B. Fat | B. Fat, Lbs. | Days. | Cows. |
|---|---|---|---|---|---|---|
| Huddy, D. J., Salisbury | G. Friesland | 7022.4 | 3.56 | 249.8 | 267 | 78 |
| McLean, L., Guinea Fowl | G. Friesland | 6694.30 | 3.72 | 249.9 | 280 | 43 |
| Freeland, P., Gwelo | G. Friesland | 6929.3 | 3.55 | 246.0 | 286 | 89 |
| Kirstein, J. A. G., Gwelo | Guernsey | 5460.2 | 4.50 | 245.9 | 264 | 7 |
| Sheffield, L. F., Macheke | G. Friesland & G. Shorthorn | 6380 | 3.84 | 245.1 | 277 | 9 |
| Meikles Trust & Invest. Co., Ltd., Shangani | P.B. & G. Friesland | 6812.1 | 3.59 | 245.0 | 270 | 115 |
| Tennent, A. W., Headlands | G. Friesland | 6450.1 | 3.78 | 244.0 | 269 | 63 |
| McCay, J. U., Bulawayo | P.B. & G. Friesland | 7182.8 | 3.39 | 243.7 | 290 | 34 |
| Van Niekerk, Miss I. E., Inyanga | G. Friesland | 6645.9 | 3.66 | 243.5 | 290 | 8 |
| Edwards, Mrs. D. M., Eiffel Flats | G. Friesland | 6805.0 | 3.55 | 241.6 | 272 | 11 |
| Allan, Mrs. M., Salisbury | G. Friesland | 7189.1 | 3.32 | 238.6 | 293 | 28 |
| Forrester, F. W., Marandellas | G. Friesland | 6749.0 | 3.51 | 236.6 | 294 | 16 |
| Tennent, H. A., Rusape | G. Friesland | 5493.8 | 4.36 | 238.6 | 275 | 9 |
| Dawne, B. St. J. Douglas, Guinea Fowl | G. Friesland & G. Guernsey | 5653.3 | 4.16 | 235.1 | 269 | 69 |
| Gibbs, Hon. H. V., Redbank, Bulawayo | G. Friesland | 6941.1 | 3.38 | 234.5 | 286 | 52 |
| Red Valley Estate, Marandellas | G. Friesland | 6391.5 | 3.65 | 233.6 | 274 | 17 |
| Turnbull, Mrs. M., Bulawayo | G. Friesland | 6951.6 | 3.35 | 233.0 | 278 | 21 |
| Robertson Syndicate, Ltd., Bulawayo | P.B. Friesland | 6904.1 | 3.37 | 232.8 | 254 | 10 |
| Everard, Mrs. M., Inyazura | P.B. & G. Friesland | 6299.0 | 3.67 | 231.1 | 278 | 24 |
| Gebbie, W. N., Tatagura | G. Friesland | 6048.7 | 3.79 | 229.5 | 300 | 35 |
| Bradley Bros., Bulawayo | G. Friesland | 6624.0 | 3.47 | 228.9 | 298 | 27 |
| Government Farm, Gwelo | G. Friesland | 6886.1 | 3.30 | 227.2 | 253 | 32 |
| Linton, P., Salisbury South | G. Friesland | 6127.6 | 3.70 | 226.8 | 284 | 21 |
| Fischer, Mrs. H. C., Headlands | G. Friesland | 6558.4 | 3.45 | 226.5 | 284 | 30 |
| McLean, J. H., Gwelo | G. Friesland & G. Red Poll & G. Ayrshire | 5743.2 | 3.88 | 222.6 | 287 | 69 |
| Swaine, E., Gwelo | G. Friesland | 6435.6 | 3.44 | 221.8 | 286 | 45 |
| Morrisby, F. R., Gwelo | G. Friesland | 6579.4 | 3.36 | 221.1 | 279 | 57 |
| Susman & Newfield, nterprise | G. Friesland | 6688.3 | 3.34 | 221.1 | 290 | 28 |
| Duff, J. N., Marandellas | G. Friesland | 5752.2 | 3.82 | 220.0 | 288 | 62 |
| Brereton, Miss N., Gwelo | G. Friesland & G. Guernsey | 5687.5 | 3.85 | 219.0 | 276 | 29 |
| Boyd-Clark, C., Inyazura | P.B. & G. Friesland | 6353.5 | 3.43 | 217.7 | 276 | 32 |
| MacIntyre, J., Shamva | G. Friesland, G. Ayrshire & G. Guernsey | 6041.4 | 3.60 | 217.5 | 284 | 11 |

## SEMI-OFFICIAL HERD AVERAGES, 1948-49—(Continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Fischer, W. F., Headlands | G. Friesland | 5621.7 | 3.83 | 215.3 | 264 | 142 |
| Cross & Son, Bulawayo | G. Friesland | 6408.5 | 3.36 | 215.2 | 261 | 67 |
| Dobson, A. B., Norton | G. Friesland | 5701.4 | 3.77 | 215.2 | 297 | 40 |
| Barry, J. H., Umtali | G. Shorthorn | 5254.4 | 4.09 | 215.0 | 276 | 28 |
| Morant, Commander E. L., Salisbury South | G. Friesland & G. Ayrshire | 5449.0 | 3.94 | 214.5 | 288 | 29 |
| Morris, G. R., Salisbury South | G. Guernsey, G. Ayrshire & G. Friesland | 5729.8 | 3.74 | 214.5 | 273 | 37 |
| Anderson, I. D. H., Fort Victoria | G. Friesland | 6364.9 | 3.37 | 214.3 | 279 | 19 |
| MacIlwaine, J. N. L., Marandellas | G. Friesland | 5825.3 | 3.68 | 214.2 | 288 | 22 |
| Norvall, K., Bulawayo | P.G. & G. Friesland | 6086.9 | 3.50 | 212.9 | 276 | 109 |
| Huddy, Mrs. M. E., Salisbury | G. Friesland, G. Guernsey & G. Shorthorn | 5215.8 | 4.08 | 212.8 | 264 | 43 |
| Rogers, Mrs. M., Gwelo | G. Friesland | 5732.1 | 3.70 | 211.1 | 243 | 37 |
| Stobart, H., Enterprise | G. Friesland & G. Red Poll | 4623.2 | 4.56 | 211.1 | 279 | 12 |
| Bredenkamp, J. D., Ruwa | G. Friesland | 4962.4 | 4.24 | 210.5 | 289 | 26 |
| Huddy, L., Salisbury | G. Guernsey & G. Friesland | 5812.5 | 3.61 | 209.9 | 274 | 63 |
| Cary, L. E. O. Trelawney | G. Ayrshire | 5722.8 | 3.66 | 209.6 | 279 | 18 |
| Lay, H. T., Headlands | G. Friesland | 5571.3 | 3.75 | 209.2 | 272 | 37 |
| Green, E. E. C. (Kloof), Bulawayo | G. Friesland | 5788.7 | 3.58 | 207.5 | 280 | 17 |
| Odendaal, V. P., Chipinga | G. Friesland | 5505.7 | 3.70 | 203.1 | 298 | 10 |
| Krahner, Mrs. M. M., Banket | G. Friesland | 5413.4 | 3.72 | 201.6 | 284 | 21 |
| Cumming, John, Norton | G. Friesland | 5210.4 | 3.86 | 201.0 | 278 | 23 |
| Moore, S., Salisbury South | G. Friesland & G. Guernsey | 5639.0 | 3.55 | 200.2 | 286 | 30 |
| Sinclair, S. M., Melsetter | G. Ayrshire | 4731.7 | 4.22 | 199.8 | 285 | 13 |
| Mungle, J. T., Odzi | G. Friesland | 4870.9 | 4.09 | 199.2 | 287 | 30 |
| Stanger, E., Rusape | G. Friesland | 4877.4 | 4.08 | 199.0 | 281 | 36 |
| Green, R. J., Guinea Fowl | G. Friesland | 5267.0 | 3.77 | 198.8 | 285 | 7 |
| Marshall, D. W., Old Umtali | G. Friesland | 5242.6 | 3.79 | 198.6 | 274 | 32 |
| Taylor, L., Selukwe | G. Friesland | 5092.6 | 3.83 | 195.4 | 264 | 59 |
| Timms, P. S., Rusape | G. Friesland | 5240.1 | 3.72 | 195.2 | 275 | 22 |
| Thurlow, J. G., Bindura | G. Red Poll & G. Friesland | 5170.9 | 3.76 | 194.8 | 288 | 52 |
| Valentine, G. W., Odzi | G. Guernsey & G. Friesland | 4645.3 | 4.12 | 191.8 | 263 | 17 |
| Futter, G. G., Gwelo | G. Friesland & G. Guernsey | 4901.4 | 3.91 | 191.7 | 257 | 46 |
| Kingston Farm Syndicate, Bindura | G. Friesland | 5170.8 | 3.70 | 191.7 | 282 | 18 |

## SEMI-OFFICIAL HERD AVERAGES, 1948-49—(Continued)

| Name. | Breed. | Milk, Lbs. | % B. Fat | B. Fat, Lbs. | Days. | Cows. |
|---|---|---|---|---|---|---|
| Barrett, N. G., Rusape | G. Friesland | 5204.6 | 3.68 | 191.4 | 284 | 52 |
| Bedford, J. R., Marandellas | G. Friesland & G. Guernsey | 4737.2 | 4.04 | 191.3 | 300 | 10 |
| Ballantyne, R A., Salisbury | G. Friesland | 5221.1 | 3.66 | 191.1 | 276 | 113 |
| Robinson, G. W., Salisbury | G. Friesland | 5234.6 | 3.63 | 190.0 | 277 | 62 |
| Black, Mrs. M., Bindura | G. Friesland | 5227.0 | 3.62 | 189.4 | 284 | 28 |
| Austen, C. A., Que Que | G. Friesland | 5227.9 | 3.58 | 186.9 | 272 | 12 |
| Dold, J. B., Salisbury | G. Friesland | 5372 7 | 3.46 | 185.9 | 271 | 29 |
| Salvation Army, Salisbury | G. Ayrshire | 4869.0 | 3.81 | 185.8 | 284 | 37 |
| Burras, M. W., Bulawayo | G. Friesland | 5319.8 | 3.49 | 185.6 | 272 | 29 |
| Bickley, late K., Heany Junction | G. Friesland & G. Red Poll | 4729.5 | 3.91 | 185.1 | 261 | 52 |
| Brucehame Dairy, Fort Victoria | G. Friesland | 5115.7 | 3.62 | 184.9 | 286 | 33 |
| King, D., Concession | G. Friesland | 5384.3 | 3.43 | 184.7 | 261 | 45 |
| Anderson, G. R., Gwelo | G. Friesland | 5165.4 | 3.57 | 184.1 | 288 | 66 |
| Cooper, J. L., Fort Victoria | G. Friesland<br>G. Red Poll & G. Jersey | 4709.1 | 3.89 | 183.2 | 266 | 12 |
| Hards & Liddle, Marandellas | G. Guernsey | 3597.6 | 5.08 | 182.7 | 254 | 9 |
| Mitchell, C. F., Essexvale | P.B. & G. Red Poll | 4809.0 | 3.78 | 181.8 | 260 | 33 |
| Rutherford, J. F., Marandellas | G. Friesland | 5035.3 | 3.57 | 180.1 | 276 | 14 |
| Fleming, G. N., Salisbury | P.B. & G. Red Poll | 4763.4 | 3.74 | 178.2 | 287 | 46 |
| Rhodesian Corporation, Norton | G. Friesland | 4810.8 | 3.66 | 175.9 | 272 | 31 |
| Pascoe, T. C., Salisbury | G. Friesland | 4754.1 | 3.69 | 175.4 | 290 | 96 |
| Bowen, P. A., Salisbury | G. Red Poll | 4286.4 | 4.06 | 174.0 | 286 | 22 |
| Brooke, Colonel P. A., Salisbury | G. Friesland & G. Red Poll | 4729.0 | 3.64 | 172.2 | 278 | 27 |
| Gordon-Lennox, R., Marandellas | G. Friesland | 4455.5 | 3.86 | 172.1 | 300 | 5 |
| Miles, Estate late B. L., Banket | P.B. & G. Red Poll | 4193.6 | 4.08 | 171.3 | 259 | 28 |
| Newton, P., Melsetter | G. Friesland | 4657.6 | 3.60 | 168.6 | 291 | 6 |
| Valentine, A. F. H., Umtali | P.B. Guernsey, G. Guernsey & G. Friesland | 3731.4 | 4.50 | 167.8 | 272 | 16 |
| Hughes, J. A. G., Goronmonzi | G. Friesland, G. Jersey, G. Ayrshire & G. Red Poll | 4377.3 | 3.80 | 166.3 | 259 | 27 |
| Maunsell, G. M. B., Bromley | G. Friesland | 4098.7 | 3.97 | 162.7 | 255 | 9 |
| Parsons, Mrs. P., Marandellas | P.B. & G. Friesland | 4151.7 | 3.81 | 158.3 | 239 | 9 |

## SEMI-OFFICIAL HERD AVERAGES, 1948-49—(Continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Bowyer, R. J., Theydon | G. Guernsey & G. Red Poll | 3743.5 | 4.21 | 157.6 | 248 | 19 |
| Mitchell, Misses I. and J., Odzi | G. Friesland | 3687.1 | 4.25 | 156.9 | 284 | 26 |
| Gordon-Kay, R., Bulawayo | G. Friesland | 4560.5 | 3.43 | 156.7 | 228 | 10 |
| Farmer, J. H., Bindura | G. Friesland | 3943.9 | 3.89 | 153.5 | 274 | 12 |
| James, Mrs. Y. V. Russell, Golden Valley | G. Friesland | 4189.7 | 3.64 | 152.5 | 258 | 61 |
| Mutumbara Mission, Cashel | G. Friesland | 4006.1 | 3.77 | 151.2 | 279 | 20 |
| Barry, Colonel G., Nyamandhlovu | G. Red Poll & G. Guernsey | 3561.1 | 4.08 | 145.4 | 228 | 10 |
| Christo, O. L., Gwelo | G. Ayrshire & G. Friesland | 3979.5 | 3.62 | 144.1 | 290 | 52 |
| Haywood, Estate W. D., Gatooma | G. Guernsey | 3639.2 | 3.93 | 143.0 | 297 | 35 |
| Huggins, Sir G. M., Enterprise | G. Friesland | 4122.8 | 3.43 | 141.3 | 272 | 62 |
| Stockil, R. O., Fort Victoria | G. Friesland | 3959.8 | 3.54 | 140.2 | 270 | 28 |
| Coke-Norris, H. A., Umtali | G. Friesland, G. Guernsey & G. Red Poll | 2999.8 | 4.46 | 133.7 | 259 | 26 |
| Waddilove Training Institute, Marandellas | G. Friesland | 3473.3 | 3.78 | 131.5 | 283 | 35 |
| Haydock, E., Macheke | G. Red Poll, G. Friesland & G. Shorthorn | 2854.1 | 4.39 | 125.3 | 206 | 29 |
| Simpson, K. M., Enterprise | G. Red Poll | 3204.2 | 3.87 | 124.0 | 240 | 43 |
| Gebhardt, G. F., Gwelo | G. Friesland & G. Red Poll | 3286.6 | 3.77 | 124.0 | 252 | 41 |
| Marshall, C. J., Melsetter | G. Friesland, G. Jersey & G. Afrikander | 3043.2 | 3.77 | 114.6 | 231 | 18 |
| Miller, H. F., Lalapanzi | G. Friesland & G. Ayrshire | 2581.4 | 4.08 | 105.5 | 240 | 50 |
| Moffat, R. L., Shangani | G. Ayrshire | 2010.4 | 5.06 | 101.8 | 134 | 5 |
| Old Umtali Mission, Old Umtali | G. Friesland | 2606.9 | 3.76 | 98.1 | 263 | 12 |
| Winwood, E. R., Melsetter | G. Shorthorn | 2189.6 | 4.49 | 98.0 | 189 | 7 |
| Stead, Lieut.-Colonel F. H., Que Que | G. Friesland | 2122.9 | 3.19 | 67.9 | 156 | 5 |

### AVERAGE FOR SEMI-OFFICIALLY RECORDED HERDS.

| | |
|---|---|
| Milk, lbs. | 5847.0 |
| Butterfat, lbs. | 215.6 |
| Average Butterfat | 3.69% |
| Days | 282 |
| Cows | 34 |
| Completed lactations | 5025 |

### AVERAGE FOR OFFICIALLY AND SEMI-OFFICIALLY RECORDED HERDS.

| | |
|---|---|
| Milk, lbs. | 5891.4 |
| Butterfat, lbs. | 217.6 |
| Average Butterfat | 3.70% |
| Days | 277 |
| Cows | 33 |
| Completed lactations | 5173 |

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THE RHODESIA

Agricultural Journal

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# Editorial

## Notes and Comments

### POWER ON SMALL FARMS
### TRACTOR VERSUS THE HORSE

In the above article* the author, who has collected information when touring some 50 farms of less than 50 acres with tractors, shows that over the past two years 12 medium-powered tractors worked at an average cost of 3s. an hour, including depreciation, when employed for an average of 1,446 hours in the two years. The following table gives an analysis of the running costs:—

ANALYSIS OF RUNNING COSTS

Hours worked, 1,446

| | | | |
|---|---|---|---|
| Maintenance Material | £6 | 9 | 4 |
| Lubricants | 9 | 2 | 0 |
| Bought Labour | 2 | 9 | 2 |
| Own Labour | 9 | 19 | 4 |
| Total | £27 | 19 | 10 |

| | d. per hour |
|---|---|
| Cost per hour as above | 4.64 |
| Tyres—33⅓% p.a. | 1.928 |
| General Overhaul—say £20 p.a. | 4.97 |
| Total | 11.538 |
| Fuel, @ 2s. 1½d. per gallon | 12.75 |
| First Year Depreciation—(less tyres) @ 22½% p.a. | 10.85 |
| Total | 35.128 |

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* NOEL NEWSOME.—*Power on Small Farms.* **Edenbridge Kent. Journal of Ministry of Agriculture, February, 1950.**

It is emphasised that when considering mechanisation one must remember that output is more important than acres, because a successful farmer plans for and does increase output. Therefore it is not acreage, but the **potential output,** that must determine the justifiable capital outlay on a tractor.

The author discusses labour costs on farms in Britain to-day and considers that if a worker were given a tractor instead of a couple of horses, that at least three times as much ploughing would be done, as practically all his working hours can be devoted to ploughing and no time is lost in feeding and grooming the horses.

Again, transport occupies 50 per cent. of the time of draught-power on any farm. A load of three tons can be pulled at ten miles per hour with a medium-powered tractor compared with a horse's 30 cwt. at something like four miles per hour. The 2s. 6d. an hour therefore spent on labour with a tractor becomes worth over 15s. compared with men working horses.

From figures obtained at The Lord Wandsworth College, it costs £119 a year to keep a pair of horses compared with £108 for a tractor, at the hourly cost (3s.) which has been quoted for about 700 hours a year. In addition to this, the cost of the horses' food must be considered. Scotch figures show that to keep a horse for a year in working condition 1.4 tons of oats and 1.9 tons of hay are required. This accounts for nearly three acres of land, which become five or more when grazing is included. For a pair of horses 10 acres are required. It is reasonable to assume that a farm makes a profit of £15 to £20 an acre, therefore horse farms lose a potential £200 profit before the horses begin to eat. To sum up then, the small farm which cannot pay with a tractor is bound to lose more heavily with horses from the maintenance of power only. There is also the superiority in mechanical power mentioned above to be considered.

Another point which the author stresses is that the hours of useful employment for the tractor increase yearly through the introduction of new subsidiary branches of production.

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### The I.C.A. Conference.

The Second I.C.A. Conference was held in Salisbury on June 12 and 13. The Prime Minister, Sir Godfrey Huggins, opened the conference, which was attended by delegates from 67 committees from all parts of Southern Rhodesia.

# Some Notes on Freshwater Fishes in S. Rhodesia

## PART IV

By R. A. JUBB, B.Sc.

The Genus Barbus is well represented in Africa; Boulenger records 185 species, and, of this number, about forty species have been recorded as taken from waters in Southern Rhodesia. Beyond our borders there are species that grow to a considerable size. For instance, specimens of the "Yellow-fish" of the Transvaal, caught by fair angling, have weighed as much as 32 lbs.; this refers to the indigenous fish *Barbus aeneus*, and not to the imported "carp" of the same family. To date however, no specimen of *Barbus* has peen taken in Rhodesia with a weight much in excess of seven pounds.

The majority of species are small, and in the adult stage are four to five inches long, and are usually mistaken for young fish in the fingerling stage. They undoubtedly play their part in the food chain as forage fish for larger predatory species, but they are also useful in assisting to control the breeding of mosquitoes. Prof. J. L. B. Smith writes as follows: "Some of the smaller species (e.g., *Barbus paludinosus*) occur in vast numbers, and, being carnivorous, probably play a considerable part in combating the mosquito menace in tropical and sub-tropical areas. These species multiply even in restricted waters, so they might perhaps, with advantage, be used to stock waters in mosquito infested areas in South Africa."

In January this year the writer obtained some specimens of *Barbus paludinosus* from the Gwebi River near Salisbury, and transferred six lively little fish to a garden pond from which all other fish had been removed. As was to be expected, mosquitoes laid their eggs and larvae of the first stage developed, but, in spite of careful and frequent observations no larvae appeared to survive or reach the second stage. Their usefulness in controlling mosquito breeding has been clearly demonstrated, and these small species can serve a useful purpose if introduced into ponds or dams.

Of the small species, the most common are *Barbus paludinosus* and *Barbus trimaculatus*, all generally known as minnows or "gillieminkies." The photographs are of specimens obtained in the Gwebi River.

*Barbus paludinosus.* Well distributed and found in most streams and the insides of Black Bass. Hardy, and can be bred in ponds and dams. For food, they consume, with avidity, earthworms set as bait on hooks for bream, mosquito larvae, and freshwater crustacea. The fish is shy, and usually hides during the day, it feeds at dusk or in the moonlight; this is a pity, as, in its small way it is quite a handsome creature. In the adult stage the length is little over three inches, the back is dark, with a blueish sheen, the belly silvery white. The iris of the eye is strikingly golden and the operculum (gill cover) has a golden sheen. The mouth is terminal, and there are a pair of short barbels on each side, one pair can just be seen if you examine the photograph carefully.

*Barbus trimaculatus.* Slightly larger than the species discussed above, the adults hopefully reach a length of four inches before they either get entangled with a hook or get swallowed by a hungry predator. This species is widely distributed, and can be bred in restricted waters. The colour varies, when alive, from silvery with darkish back, to pale golden with darkish back. The photograph shows a dark spot on the base of the caudal fin; some specimens have as many as three spots spaced along each side above the lateral line. In live fish these spots can be entirely absent, but they appear some hours after death. The mouth is described as sub-inferior, there are a pair of barbels on each side.

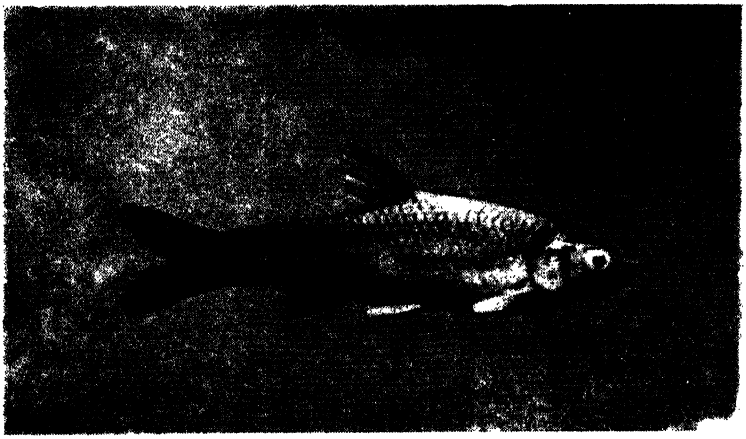
Both species are powerful swimmers, and are equally at home in pools or streams.

*Tilapia melanopleura.* Those persons who have studied Dr. Hickling's recommendations regarding the type of bream to introduce into dams for fish culture will be interested to hear that *Tilapia melanopleura* can be found in the Umshandige Dam near Fort Victoria in considerable numbers. This species has been mentioned in Part I, and, coupled with *Tilapia mossambica*, has received some publicity in the Press. The fish is widely distributed, and is to be found in most rivers and lakes of Africa, but there are local variations, so much so that a recent revision of the *Cichlidae* of Africa resulted in no fewer than five species being re-grouped as *Tilapia melanopleura*.

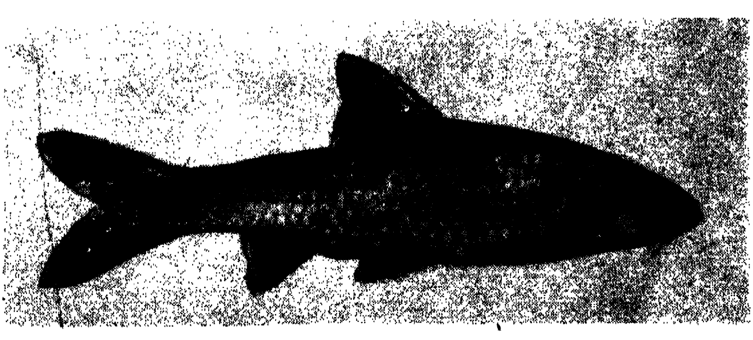
This important fish which was introduced into the Umshandige from the lower Sabi River, has flourished and bred in numbers. Previous to this, the species was not found above the Chiribira Falls of the Sabi River, or in the Lundi above the Chipinda Pools.

The photograph is of one of the specimens very kindly forwarded by Mr. H. P. Dimmock, of Umshandige. In shape, *Tilapia melanopleura* is deeper than other types of bream caught locally, the profile of the snout is characteristic, the mouth small and the colour, although variable, quite distinctive. In general, the back is dark green, and the belly and throat pink. During the breeding season, the males assume a more

*Rainbow Bream* (Tilapia melanopleura).
[Photo by: R. A. Jubb.



*Minnow* (Barbus paludinosus).
[Photo by: R. A. Jubb.



*Minnow* (Barbus trimaculatus).
[Photo by: R. A. Jubb.

vivid colouring. The local names vary from "Olive Bream" in Northern Rhodesia to "Golden" or "Rainbow Bream" in Southern Rhodesia.

The following observations made by Mr. Dimmock are quoted from his letter: "Personally, I think the name "Golden Bream" is not a good one. I have also heard them called "Sabi Bream," "Kafue Bream" and "Rainbow Bream." I think the last name best, possibly because the first one I caught took a bass plug, and as it surfaced, the momentary flash was not unlike the colour of a Rainbow Trout. The colour is not golden, but an irridescent pink all over the belly, merging at times into a deep crimson at the throat. The colour fades after the fish has been out of the water awhile, leaving the belly a pale olive." Regarding size and feeding habits, he adds: "I can state as a fact that one of these fish taken in the Umshandige weighed 2¼ lbs., and have heard of one of 2½ lbs. The fish seem to prefer the shallows and heavily weeded water."

Whilst there is no doubt about the successful propagation of the fish in the waters of the Umshandige, the reason for the scarcity of the species in waters around Salisbury requires investigation. Specimens of *Tilapia melanopleura* have been taken from both the Cleveland and the Prince Edward Dam, but not in the adult stage.

# Coffee Growing in S. Rhodesia

By M. A. CASSIDY, B.Sc. (Agr.),
Assistant Horticulturist

**General.** Coffee is indigenous to Central and Eastern Africa, including a few areas along the Eastern border of Southern Rhodesia. Among the largest coffee producing countries in the world are Brazil, Jamaica, Santo Domingo, Porto Rico, and East Africa.

By the planting of suitable varieties, and by giving the plantations fair cultural treatment, there is every prospect of coffee becoming one of the leading crops along the eastern border, and in inland districts where the climatic conditions are favourable for the crop.

**Climate and Situation.** Coffee is essentially a tropical plant. The most suitable climate for coffee cultivation is that found in the hilly regions of the tropics, 1,000 to 6,000 feet above sea level, the exact altitude being controlled to a large extent by latitude and rainfall.

The temperatures best suited to the coffee plant ranges from 55°F. to 80°F., with rainfall of from 60-100", with a dry period during the winter. Coffee requires a distinctly humid atmosphere, and the prevalence of heavy winds is more objectionable than a dry atmosphere and low rainfall.

The best quality coffee is produced in mountainous regions where a mild summer is experienced, and where no heavy frosts occur during the winter months. Coffee of good quality can also be produced in the lower altitudes.

The areas most suited to coffee plantings in Southern Rhodesia are the mountainous regions along our Eastern border from Inyanga through Umtali, Melsetter and down to Chipinga and Mount Selinda. Here, there appears to be large tracts of country suitable for coffee plantations, and in most cases there is little or no necessity to resort to irrigation.

The dry period during the winter reduces the yield, but produces a bean of good quality, with excellent liquoring quality.

**Soil.** Since the coffee plant has a long tap root it will thrive best in a deep soil. The best soil is a well-drained, deep, loamy soil, rich in humus, preferably overlying a gravelly foundation.

Bad drainage results in the accumulation of stagnant water around the roots, and this is, of course, fatal. Poor sands and stiff clay soils are useless.

**Shade trees for coffee.** It is customary for shade trees to be planted, at least in all the lower plantations. Coffee in its wild state is generally believed to be forest shrub, growing

*A single stem coffee bush growing at Umtali.*
[Photo by: E. T. Brown, Umtali.

*Coffee bushes planted in November, 1948, at Umtali.*
[Photo by: E. T. Brown, Umtali.

*Coffee plants in tins ready for planting out.*

[Photo by: E. T. Brown, Umtali.

*A multiple stem coffee bush growing at Umtali.*

[Photo. by: E. T. Brown, Umtali.

in glades between or below high forest, in a soil rich in organic matter, and protected from any sudden change of temperature or humidity. It would be expected that the best conditions for coffee would be found when the natural conditions were copied as nearly as possible; larger crops have been taken from trees under shade than from comparable trees in the open. Actually while heavy cropping is rare under shade, the average crop, year out and year in, is larger.

The actual effect of shade, the value of leaf mulch, nor the soil aeration effect of the shade tree roots is yet known.

The ideal shade tree is not yet known, the most desirable type of tree is one with a spreading habit, well clear of the ground to allow the free passage of air below, a deep root system which will not take too much from the ground of anything required by the coffee. Preferably, it would appear that the tree should, therefore, be leguminous, and return to the soil in the form of a leaf mulch, materials brought from the air above the coffee.

Many indigenous trees already growing in the area may be used.

**Some trees in common use.** *Grevillea robusta.* This has been the commonest used shade tree in the past, following Indian practice. It is not recommended for general use as a shade tree, as the shape is wrong, it is excellent for avenues (widely spaced), and for windbreaks, and is useful as a semi-permanent shade tree. Plant 40′ apart. Non-leguminous.

*Albizzia moluccana* (A. Falcata). Possibly the best of the *Albizzia* sps. for shade in coffee. It is said to be brittle, so should not be planted alone in exposed situations. High light shade. Plant 80′ apart. Leguminous

*Cajanus indicus*, or pigeon pea; suitable as a temporary shade for one, or two, or three years in young coffee, while more prominent shade trees are being established. Valuable as a soil deepener and reviver. Plant 6′-10′ apart. Leguminous.

**Varieties of Coffee.** The most promising variety in this country is the copper-tipped Blue Mountain coffee. This variety belongs to the species *C. arabica.* The rare flavour of Blue Mountain coffee is not due to the species grown, but seems to be the combination of altitude and peculiar soil and climatic conditions. The seed contains much oil, and the caffeine and acid content are quite high.

**Yields.** Coffee comes into commercial production the third year after planting. Average yields would be a half-ton per acre. Yields of one-ton per acre have been recorded in East Africa.

**Propagation.** Coffee plants are propagated by seed, the seedlings being raised in seed beds and nurseries. The beds should be in a sheltered position within easy reach of a good supply of water. The soil should be well manured and brought to a fine tilth. Fresh seed only should be used, and should be sown in rows at intervals of 6″. Seeds are sown about 1½″ below the surface, and 5″ from one another in the lines. Coffee seed takes from three weeks to two months to germinate, according to the time of sowing. Vermiculite should prove useful over the seeds to prevent weeds and loss of moisture. Under favourable conditions, the seedlings should be ready for transplanting after about eight or ten months. During a dry season the seedlings should be watered regularly.

**Planting.** Only seeds from those plants which are uniform in size of berry, quality, and season of ripening, should be used. A watch should be kept for sports or mutations which might prove admirably suited to prevailing conditions. Under favourable conditions the bushes may be planted 6′-8′ either way. In colder climates, where growth is less rapid, the distance is lessened to about 5′ apart. In India, the average distance is 7′ between rows, and 6′ between the plants, which means about 1,000 bushes per acre. The plants should be planted out at the beginning of the rainy season. The holes are dug 2′ square at least 3 weeks before planting. The holes are then filled in with surface soil mixed with manure and/or compost. The holes are re-opened for planting.

**Cultural Operations.** Perhaps the most outstanding success has been obtained by the application of mulches of vegetable material. The best material has been found to be banana trash, followed by elephant grass (*Pennisetum purpureum*), and thatching grass. The point is, whether bananas can be satisfactorily interplanted in coffee without disadvantage to either crop, since if this is practicable, it will materially reduce the cost of mulching.

The beneficial effect of mulching can be attributed to:

(a) Conserving soil moisture.
(b) Keeping the soil cooler.
(c) Increasing the nitrate content of the surface soil.
(d) Protecting the soil from erosion.
(e) Reducing weed growth.
(f) Increasing the soil organic matter.

**Pruning.** Outstanding improvement has also been achieved by the adoption of multiple-stem pruning in replacement of the single stem formerly widely practised. Briefly, this consists in pruning the trees so that there are three bearing stems instead of one. This leads to the crop being borne on the primary instead of the secondary branches, as is the case with single-stem pruning. As the lower primaries cease to bear, they are cut away until a point is reached, usually about the sixth year, when three new suckers are brought away from the lower parts of the parent stem, and a new cycle is established.

Results of experiments over nine years show that an increase of 75 per cent. in crop yield is obtained by the substitution of multiple-stem pruning for single-stem pruning, and that the pruning routine is less expensive and can be done by less intelligent labour.

**Irrigation.** Irrigation in conjunction with mulching proves very beneficial. During season of low rainfall, applications of water should be given to supplement the rainfall.

**Manuring.** While manuring with organic materials appears to be beneficial, little success has so far followed applications of inorganic fertilisers, at least on young coffee. The following mixture has given excellent results on average coffee soils. Nitrate of soda, 275 lbs.; Concentrate superphosphate, 140 lbs. Muriate of potash, 100 lbs. If wood ashes are available, they can be used at the rate of 200 to 500 lbs. per acre. The mixture should be lightly forked into the soil soon after the harvest, or in two instalments, one in October-November, and the second in April-May.

**Cultivation.** In a really good coffee soil, a large part of the feeding roots are to be found in or near the surface layers of the soil, and the difficulty is to find a method of tillage which, while controlling weed growth, will not damage the surface rooting system. This problem is becoming more acute as labour shortages compel the grower to adopt mechanical methods of cultivation. In regard to mechanical cultivation, the most promising form of mechanical cultivators which have so far been recommended is the rotary hoe, of which the small orchard types seem likely to be best adapted to local conditions.

**Harvesting.** Coffee berries are picked when they are red. Any dark red ones (black) are also picked. If the berry is green in colour it is waste of time and money to pick it.

**Preparation.** Light berries which are green, diseased or over-ripe are treated separately—they make inferior coffee. The heavy berries are carried by water over a few catch holes where impurities are removed, and then conveyed to a pulper. The machine removes the shell or skin from the bean. The pulped berries are then conveyed to the fermentation tanks after removal of the skins, and fermented for one to three days in order to remove the adherent slime or pulp. Then the fermented beans are washed by a rotating washer or by tramping. When clear of slime, the beans are spread out to dry, which takes a few days, and turned a few times per day until thoroughly dry.

If used locally, a huller to remove the parchment is needed. The key to success during these operations is cleanliness.

**Coffee stem borer** (*Ankores leuconotus*). The coffee stem borer has been the most destructive pest in this country, and has resulted in the failure of many coffee plantings in this country. This insect pest is most prevalent in bamboo districts.

The larva tunnels superficially in the soft bark, and when the mandibles are strong it enters the wood.

Control measures adopted against this pest are as follows:

(1) Systematic collection and destruction of adult beetles from November to the end of February.

(2) Uprooting and burning of deadwood.

(3) Clear the tunnel with wire, inject cotton wool soaked in petrol into the tunnel and seal.

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# The Menace of Plant Diseases*

By D. RHIND, O.B.E., B.Sc., F.L.S.

When large groups of one species of plant or animal are raised together under conditions differing from those in which the species occur in nature, they become liable to the attacks of parasites in an intensified form. The concentration of the parasites' food in one area frequently leads to a greater multiplication of the parasite population than would occur if the host is widely scattered. There are numerous examples of this effect. One is the increased attack of bee-hole borer in teak plantations compared to natural teak forests where the tree is scattered amongst many other species and only occurs in a density of one or two to the acre. Wherever plantations or agricultural crops are grown there is the danger of serious pests and disease breaking out in epidemic form. Though this risk has been recognised for many years it has become a more serious danger since rapid transport has made it possible to exchange planting material with distant places, whence diseases or pests new to one country may be accidentally introduced from another. Cases have occurred where a pest in its native country was not serious because it was controlled by a natural enemy, but when the accidental transfer to a new country occurred the natural predator was not included in the packet, with the result that the pest proved far worse in its new home, where sometimes physical conditions may suit it better. The planting community in Ceylon have had the danger of pests and diseases very forcibly impressed upon them and they will no doubt welcome any measures which can be adopted to lessen the risks of entry of such undesirable immigrants in the future. However strict the import regulations may be and however conscientiously they may be enforced, there will always remain some risk of an accidental introduction or one due to natural causes. That of Blister Blight on tea in 1946 was probably such a case. There is also the rare possibility of some ignorant or misguided individual evading the regulations in an attempt to introduce some supposedly superior planting material in the hope of gaining an advantage over competitors. Attempts at such evasions are deserving of the strongest condemnation. Smuggling prohibited plants is a far worse anti-social crime than the mere dodging of customs duty on a package or two.

Ceylon is a point of call for much traffic between distant lands and recently there has been a great increase in international air traffic calling here. There is therefore reason to be particularly careful about imports of planting materials and also for control of such material which may be in transit through Ceylon. Should Ceylon unluckily become a focus of infection for any new pests or diseases (such as Swollen Shoot of cocoa or South American Leaf Disease of rubber) not only would she suffer herself but she would become a potential danger to many other eastern tropical countries.

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* *The Tropical Agriculturist*, Vol. CIV, No. 4, 1948.

Darlington, in a succint letter to Nature (163, 332), recently emphasised the regrettable fact that only too often research has not been undertaken in advance of the immediate need, that when the need was not pressing it was neglected entirely or starved of funds, but that as soon as the need became urgent the scientists were expected to produce a remedy in the style of the conjuror's rabbit. It has also been neglected because often its possibilities have not been known except to a few specialists, who are not generally very vocal people. The disaster of the West African cocoa virus diseases has brought home the seriousness of such neglect from one point of view but its possibilities in promoting agricultural progress should also be recognised as well. Recently efforts have been made to ascertain whether any of the clones of Asiatic rubber show resistance to the South American Leaf Disease, a disease which has hitherto prevented the profitable growing of plantation rubber in that region, despite its being the natural home of the tree. These tests are being done at Trinidad with clonal material sent from Asia and the Ceylon Rubber Research Scheme has agreed to the testing of Ceylon-bred clones there. Some of these clones, particularly those of the NAB series, seem to be particularly promising for use in Ceylon and, while we have no immediate use for knowledge of their reactions to the South American disease, the information might be of vital importance should the disease appear in the east. Similar knowledge about Swollen Shoot diseases of cocoa would be valuable in allowing us to develop resistant clones for the replanting now going on, but naturally this information could only be obtained by tests in a country where the disease is already established. On the ground of the superiority of prevention, the breeding of resistant varieties should be regarded in the light of an insurance policy with which prudent men guard the future. It is true that every possibility cannot be foreseen and a disease or pest of insignificant importance in one country may develop serious destructiveness in a new locality. There is, nevertheless, room for the gathering together of types showing resistance which may be used for breeding purposes should the need arise. At the first meeting of the International Rice Commission in March, 1949, great importance was attached to the reporting of rice varieties which show any resistance to diseases or pests, no matter what their other characters might be, so that breeders would have an opportunity of using them in breeding programmes.

Recently a special conference was held in order to co-ordinate measures for African countries to minimise the risks of accidental introduction of pests and diseases, and another such phyto-sanitary conference was held in Singapore to perform the same service for the countries of Asia. It is hoped that by these means the risks will be reduced by co-ordinated action.

Another feature of diseases has been the manner in which they fluctuate in severity. Often a new disease is very serious soon after its introduction and then quietens down. Such a one was the *Sphacelia* disease of Sorghum which devastated the crop in India and Burma in the early thirties and almost disappeared a few years later. Sometimes the reverse happens and it is years before a disease flares up in epidemic form. *Verticillium* wilt of hops appeared in Kent in 1924 but attracted little notice till about 1938 when it became serious and did much damage. Other diseases seem to go in cycles. Such a one is Asparagus rust which was very destructive between 1898 and 1905 and then almost disappeared only to flare up again in 1933, while another is *Didymella* wilt of tomatoes which was known in England in 1885 but did little damage till 1906 when it was epidemic for a few years, then decreased in violence only to increase again and become one of the worst diseases of the crop in 1942. The causes of these fluctuations are obscure but may depend, in part at least, on varying climatic factors of baffling complexity.

The menace of diseases is clear enough and with intensified cropping and rapid long-distance transport the risks of unwelcome exchanges are increased. The best protection would seem to lie in the two measures indicated, namely, strict legislation to control movements of plant materials, and research into the production of types resistant to known diseases.

# Beaks and their Uses

By Captain G. L. JAMES
Honorary Ornithologist, Queen Victoria Memorial Museum.

All-providing Nature, which has given the various species of birds beaks most suitable to their natural food and means of obtaining it, has also endowed them with other, no less interesting, features.

Before considering beaks and their uses, let us take an unusual feature found in the Woodpecker family. In Figure 1 we see the dissected head of a Woodpecker, showing the structure of the tongue. The tongue-bones, or "hyoid" bones, are greatly lengthened, and pass over the top of the head, being fastened in the skull just above the right nostril. These long tendinous bones are accompanied by a narrow strip of muscle by which they are moved.

The tongue is furnished at the tip with a long horny appendage covered with barbs and sharply pointed at the extremity, so that the bird is enabled to project this instrument to a considerable distance from the bill, transfix an insect and draw it into the mouth. Those insects too small to be so transfixed are captured by means of a glutinous liquid poured upon the tongue from certain glands in the mouth.

The beak is strong, pointed and large for the size of the bird. Known to feed on the insects found in holes and crevices in the bark of trees, particularly on the grubs of wood-boring beetles, it was always believed that the tapping, a familiar habit of this species, was a means of finding hollows and decayed portions. To-day many ornithologists consider the tapping to be a means of keeping contact, similar to the whistle or song used by other species. Be this is it may, I have seen with binoculars a Woodpecker busy hammering a tree, then suddenly force its beak into a crevice and, by turning its head, lever off a piece of bark. On the other hand, they seldom tap when their mate is in the same tree, and when they do tap it is usual to hear an answering tapping from somewhere nearby.

Those who value trees for any reason should in no way disturb these birds, but for whose services many trees would be destroyed by boring insects.

### The Kingfisher.

The beak is strong, long and pointed, well suited to the capture and holding of fish. In the case of the Pied Kingfisher, the only one of this species in Southern Africa that hovers and drops on its prey, it will be noticed that, as it hovers, the long, pointed beak is turned down, pointing at the target; suddenly the bird drops like a stone, striking the water with considerable force. Fish are usually caught crosswise in the beak, carried to a nearby perch against which it is hammered. Before swallowing it is thrown into the air and caught lengthwise in the beak, head towards the bird's throat.

Fishermen look upon this species as an enemy, but the majority can only take small fish which, if young, should be very active and alert; those captured would therefore, unless confined in a small place void of cover or room to take avoiding action, be weaklings. Similarly, larger birds would take larger fish, which would probably be the aged or infirm. This does not apply to goldfish in a small pond, which a Kingfisher will clean up in a short space of time.

Fish and Kingfishers have been in existence for many generations, and there are still a considerable number of fish to be found so that anyone who has stocked his rivers and dams with a special variety of fish and loses them would hardly be correct in blaming Kingfishers. Lastly, nearly half the Kingfishers in Rhodesia do not eat fish, but are insectiverous and often found a considerable distance from water. Notably among these are the Striped, Brown Headed or Hooded, and Grey Headed or Hooded Kingfishers.

### The Spoonbill.

The beak is long, flattened, channelled and grooved at the base. Its food consists of shrimps, crabs, sandhoppers and similar aquatic animals. This bird also eats the roots of aquatic herbage.

A solitary and retiring bird, except during the nesting period, when it may be found associating with herons.

### Ducks (including Teal).

The beak is short and flattened. They subsist on vegetation and various aquatic creatures, **particularly** on fresh water snails, the hosts of bilharzia and liver fluke. They should be strictly protected, in fact encouraged to breed and cover our rivers and dams as the surest means of prevention of bilharzia.

A country of such vast areas and small population cannot afford a police force sufficient to watch over protected birds, but farmers can assist by not allowing shooting on their farms and taking action, no matter how inconvenient, against anyone they catch.

It must be borne in mind that it is not necessary to bathe in infected water in order to contract bilharzia; such water is a constant danger under any circumstances.

### Snipe.

The beak is long, thin and pointed. Species with similar beaks are the Anocet, Curlew and Whimbrel; these, however, have the beak curved upwards or downwards.

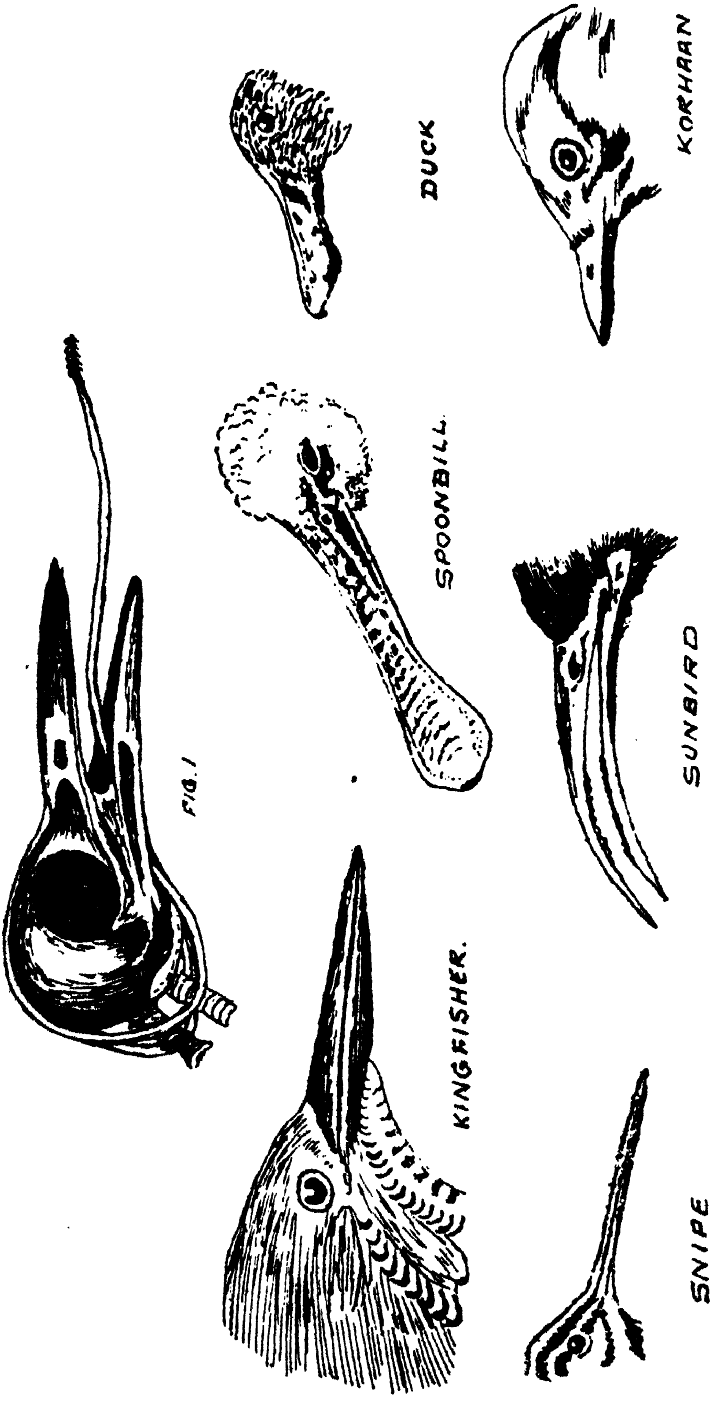
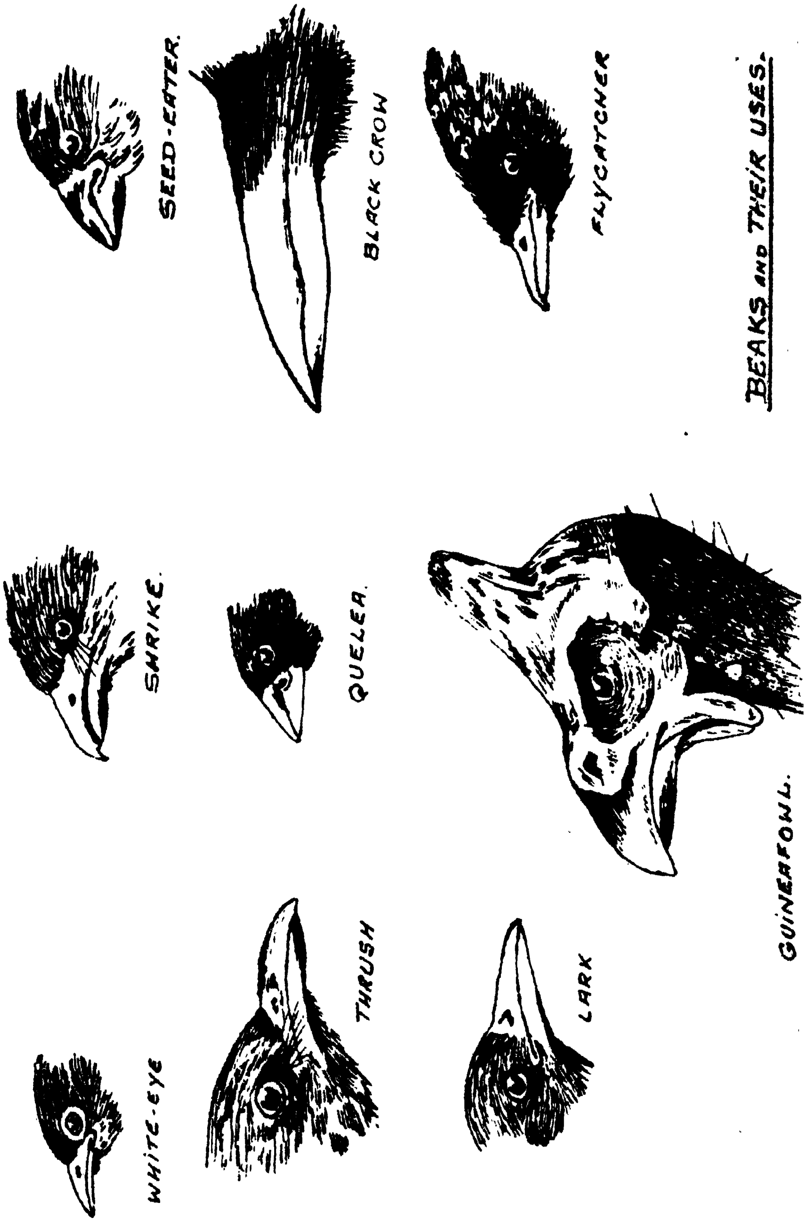


FIG. 1


BEAKS AND THEIR USES.
SEED-EATER.
BLACK CROW
FLYCATCHER
SHRIKE.
QUELEA.
GUINEAFOWL.
WHITE-EYE
THRUSH
LARK

The food of the snipe consists of worms and aquatic insects, for which it probes in marshy ground.

While this species may provide excellent sport, it must be remembered that not every bird frequents marshy ground, so many noxious insects may breed unmolested if this bird is destroyed. Further, this bird is nowhere numerous, and there are, in season, vast areas to be probed in order to keep down mankind's greatest enemy, the insect world.

### Sunbird.

Better known as Honeysuckers.

The sketch has been purposely exaggerated in order to show the serrations on the beak, which are actually minute and hardly visible to the eye.

A bird kept in captivity became listless and appeared to be sickening at the end of a week although it had been fed on sugar and water, of which it partook freely. The owner decided to release it and opened the cage door. The Sunbird immediately flew to a corner of the garden and consumed a nest of young spiders, after which it returned to the cage of its own accord. Thereafter it was set free once a week, when it hunted the garden for spiders. This, then, may be the reason for the serrations, in order to hold insects in an otherwise unsuitable beak. Many seed-eating birds kept in captivity require an occasional insect diet to retain good health.

### Korhaan or Bustards.

Beak is short and strong for devouring insects, soft shoots and seeds.

These birds are of great value to the pasture, as there are numerous insects which attack grass both above and below ground. There is a case on record in Bridgewater, U.S.A., where the ground birds were all destroyed. The following year the grass, attacked at the roots, withered and died as if blasted by fire.

The above remarks apply equally to Partridge, Francolin and Quail.

Some months ago a farmer wrote to the "Rhodesia Herald" to say that large numbers of quail had suddenly appeared on his farm, and they would have gone as suddenly as they came. It is a well-known characteristic of this species that when an area has a superabundance of their food, seeds and insects, their eggs and larvae, they will arrive in numbers only to depart when their work of cleaning the land is done. When numbers appear on your farm you will know the reason, leave them unmolested; they are doing you a great service in preserving your pasture.

### White-eye.

These small yellow birds, usually seen in small parties, with their small, sharp beaks, are insectivorous and will be seen searching trees and bushes for insects. They seek amongst the leaves, particularly the underside and the crevices in the bark. Lively and cheerfully they go about their natural business, often fortunately, unnoticed due to their small size. Little escapes their sharp, small beaks.

### Shrikes or Butcher Birds.

An article has appeared dealing with these useful birds, in which the beak is well suited to holding and tearing insects and small mammals to pieces.

### Seed-Eaters.

Note the short, stout beak, with its special and peculiar shape for cracking hard seeds and berries. These birds cause damage to seed crops, but the good must be taken into account. The young or nestlings of all seed-eating birds, except the pigeons and doves, are fed on soft insect life, such as caterpillars, grubs, moths and butterflies. They therefore render excellent service in the nesting season as well as destroying the seeds of many noxious weeds.

The point to be decided in this case and that of the Quelea is, do they do more harm than good ?

These birds appear in vast numbers in grain fields, and no doubt do a considerable amount of damage, but as each pair rear a family of, say, four chicks, each of which requires very frequent feeding on caterpillars, etc., they must destroy tremendous numbers of these pests which, if left unmolested, would destroy a crop before it reached the seeding stage. The birds do less damage and are easier to control than insects, and can be compelled to seek food elsewhere by various means other than their total destruction.

A word of warning is given in the following experience in New Zealand of a caterpillar plague:—"A caterpillar which had hitherto struggled hard for a living on native vegetation, invaded the cultivated fields and multiplied as if by magic. Beautiful green fields of wheat, miles in extent, became brown with the destructive insect. Nothing could stop it. Thousands of cattle and sheep were driven over them, house and steam rollers and fire were employed. Deep trenches of great extent were dug and covered over when full of caterpillars, but no apparent impression was made. The farmers, repenting of their folly, did their utmost to get the birds to return. Finally the Government introduced birds from England, and the one that did best was the common house sparrow. They multiplied and very soon reduced the caterpillars to the normal balance of Nature." (From "Natural History of South Africa—Birds; by F. W. Fitzsimmons, F.Z.S., F.R.M.S., etc.).

The pigeons and doves do not feed their young on soft insects, but regurgitate partly digested food. This habit has given rise to the expression "Pigeon's Milk."

**Thrush.**

Strong, stout bill for searching for insects, their eggs and larvae. May often be seen in gardens, seeking their food amongst dead leaves. Also eat berries, wild fruit and seeds.

**Crows.**

The sketch is of the Black Crow, which has a fine diet sheet, wireworms, grubs and underground beetle larvae, ticks, locusts, grasshoppers, beetles, caterpillars, snails, mice, carrion and, when this diet is insufficient, sprouting grain and seeds. The Crow family do considerable good, and the White-necked Raven and Pied Crow add snails, eggs, snakes, lizards and frogs to the long list.

The damaging of mealie cobs could be overcome by precautions rather than by destruction of the birds.

Their strong beaks are well suited to the varied and useful work they undertake.

**Larks.**

Insect feeders, while some are largely seed-eaters. They do little harm and much good in destroying insects and noxious weeds.

The beak, which varies in different species of the family, ranges from short and stout to long and thin, doubtless according to diet.

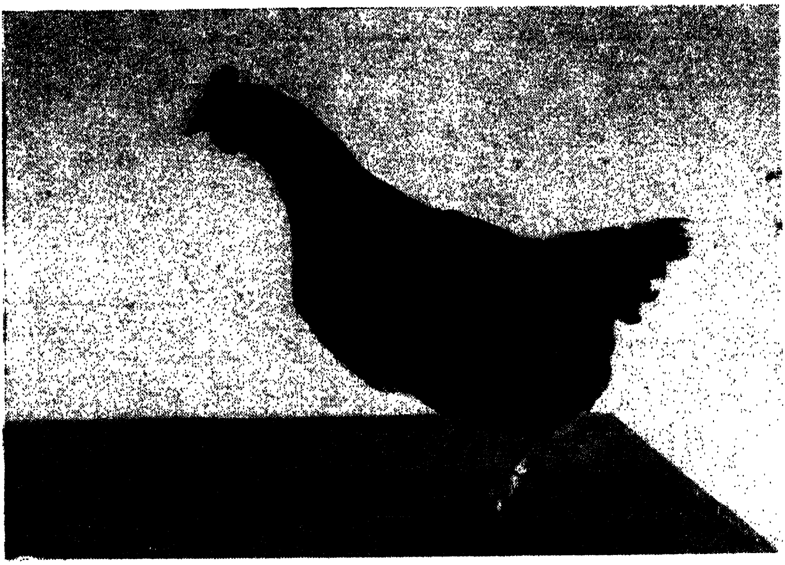
**Flycatcher.**

This family usually seize their prey on the wing and are unmolested by most people, small boys and natives excepted.

**Guineafowl.**

A very old friend sadly reduced in numbers; not above doing damage to grain and corn lands, but they also devour locusts in both the winged and wingless stages, dig up locust eggs and seek out engorged ticks. Add to this maggots and pupae of disease-carrying, blood-sucking insects such as tse-tse fly, and once again we pause to wonder if their destruction may not prove a disaster. Surely crops could be protected in order to allow these birds to carry out their good work, which is of great value to the farmer and well worth the loss of a few bags of grain, providing the crop is protected from too much depredation.

The beak is well suited to digging and seeking out their natural food, the eggs and larvae of insects.



*Bird No.* 696, *Pen* 20. *Rhode Island Red. Winner of Heavy Breed Individual Competition. Production, "A"* 307, *"B"* —, *"C"* 1 *in* 336 *days. Bred by Mrs. G. E. Wells, Salisbury.*

[Photo. by: C. G. S. Macpherson & Co., Salisbury.

*Pen* 20. *Rhode Island Reds. Winners of Heavy Breed Section, with average of* 283.5 *"A" eggs and* 292 *for all eggs in* 336 *days. Bred by, and the property of, Mrs. G. E. Wells, Salisbury.*

[Photo. by: C. G. S. Macpherson & Co., Salisbury.

# Final Report on the Thirtieth Annual Southern Rhodesia Egg Laying Test

48 Weeks : 1st March, 1949—30th January, 1950

The Test consisted of 200 single pens, allocated as follows: 55 Black Australorps and 50 Rhode Islands Reds in the Heavy Breed Section; and 95 White Leghorns in the Light Breed Section. In addition, there was an Individual Bird Competition, consisting of one bird from each team of five, nominated by the owner before despatch to the Test.

During the 48 weeks, 22 birds died, an average of 11 per cent., the deaths being proportionately evenly divided amongst the three breeds.

The average production per live bird over the 336 days for all breeds was 15.98; for Australorps, 15.91; for Rhode Island Reds, 15.83; and for White Leghorns, 16.11 per period of twenty-eight days.

The ration supplied was as follows:—

| Dry mash available at all times | % |
|---|---|
| Maize meal | 33 |
| Wheaten bran | 20 |
| Wheaten pollard | 15 |
| Meat meal | 12 |
| Ground nut cake meal | 10 |
| Lucerne meal | 5 |
| Ground limestone | 3 |
| Bonemeal | 1 |
| Fine salt | 1 |
| | 100 |

Vitaminised oil, 1 per cent. added.

In addition, 2 ozs. of wet mash per bird was given daily from March 1st to August 1st.

Grain was given daily in the afternoon at approximately 2 ozs. per bird. The grain mixture was as follows:

| | % |
|---|---|
| White cut maize | 60 |
| Munga (*Pennisetum typhoides*) | 30 |
| Sunflower seed | 10 |

Cut green lucerne was fed daily in wire baskets. Oyster shell grit was available at all times, and fresh water by automatic system.

The birds were intensively housed, and grain was fed in scratching litter.

The second inspection at the termination of the Test resulted in seven birds being disqualified. One bird was blind, and four showed serious loss of eye colour. Two birds were underweight.

The breed standard was uniformly good; mortality was average at 11 per cent. Broodiness was above normal, and small eggs formed too high a percentage of the total. These two faults can be corrected by careful breeding, and extra attention to them is obviously required.

The record of the winning Rhode Island Red pen deserves special mention. It is the highest total ever achieved on this Test. The four birds averaged 283.5 "A" grade eggs, and 292 for all eggs. The individual hen, No. 696, from the same pen created a Rhodesian Test record of 307 "A" grade eggs in the 336 days.

The highest individual records in each breed were as follows:

| *Owner* | *Bird No.* | *Breed* | *Record* A. | B. | C. |
|---|---|---|---|---|---|
| Hetkruis Poultry Farm, Steynsrust | Pen 4—617 | B. Australorp | 276 | — | — |
| Mrs. G. E. Wells, Salisbury | Pen 20—696 | Rhode Island Red | 307 | — | 1 |
| B. C. Waller, Salisbury | Pen 38—787 | White Leghorn | 265 | — | — |

**Final Results:**

### Section I—Teams

(Positions are calculated on the total number of 1¾ oz. and over eggs for the first two periods, and subsequently on the total number of 2 oz. and over eggs laid by the four leading hens in each pen of five.)

| *Pen* | *Posn.* | *Owner* | *Residence* | *Breed* | *Results 1/3/49-30/1/50* A | B | C |
|---|---|---|---|---|---|---|---|
| | | *HEAVY BREED SECTION* | | | | | |
| 20 | 1 | MRS. G. E. WELLS | Salisbury | R.I.R. | 1,134 | 6 | 28 |
| 15 | 2 | D. MAYGER | Bulawayo | R.I.R. | 935 | 24 | 7 |
| 16 | 3 | NORFOLK POULTRY FARM | Odzi | R.I.R. | 886 | 26 | 14 |
| 10 | 4 | J. A. van Niekerk | Inyazura | B.Aust. | 868 | 12 | 15 |
| 1 | 5 | Eddystone Stud P. Yards | Bulawayo | B.Aust. | 852 | 19 | 22 |
| 7 | 6 | L. S. Maree, Eeram | Vlielkraal | B.Aust. | 804 | 5 | 8 |
| 5 | 7 | Mrs. E. T. Hitchcock | Bulawayo | B.Aust. | 782 | 6 | 10 |
| 19 | 8 | Vicdale P. Farm | Dalview | R.I.R. | 772 | 10 | 5 |
| 8 | 9 | Mrs. N. A. L. Parsons | Salisbury | B.Aust. | 738 | 35 | 36 |

### *HEAVY BREED SECTION—continued*

| | *Pen* | *Posn.* | *Owner* | *Residence* | *Breed* | *Results* 1/3/49-30/1/50 | | |
|---|---|---|---|---|---|---|---|---|
| X | 4 | 10 | Hetkruis P. Farm | Steynsrust | B.Aust. | 730 | 3 | 7 |
| | 13 | 11 | Gables P. Farm | Bulawayo | R.I.R. | 724 | 5 | 6 |
| XX | 11 | 12 | T. B. Wright | Highlands, C.P. | B.Aust. | 717 | 2 | 1 |
| | 6 | 13 | Lindisfarne P. Farm | Bulawayo | B.Aust. | 673 | 46 | 64 |
| XX | 21 | 14 | Glenaholm P. Farm | Pietermaritzburg | R.I.R. | 653 | 3 | 6 |
| | 18 | 15 | Sanda P. Farm | Salisbury | R.I.R. | 622 | 68 | 73 |
| X | 14 | 16 | V. A. Lawrence | Salisbury | R.I.R. | 616 | 28 | 67 |
| X | 2 | 17 | Alan V. Bauer | Kingwilliamsto'n | B.Aust. | 611 | — | 9 |
| X | 9 | 18 | Sparrenhof Farm | Benoni | B.Aust. | 603 | 1 | 4 |
| | 12 | 19 | Eddystone Stud P. Yards | Bulawayo | R.I.R. | 473 | 39 | 15 |
| XX | 17 | 20 | A. W. Peters & Sons | Cambridge, C.P. | R.I.R. | 254 | 90 | 88 |
| X | 3 | 21 | Gables P. Farm | Bulawayo | B.Aust. | 233 | 1 | 1 |
| | | | | | | 14,680 | 429 | 486 |

### *LIGHT BREED SECTION*

| | *Pen* | *Posn.* | *Owner* | *Residence* | *Breed* | *Results* 1/3/49-30/1/50 | | |
|---|---|---|---|---|---|---|---|---|
| | 38 | 1 | B. C. WALLER | Salisbury | W.L. | 906 | 10 | 20 |
| | 37 | 2 | J. A. VAN NIEKERK | Inyazura | W.L. | 904 | 6 | 29 |
| | 31 | 3 | T'CHOMA POULTRY FARM | Salisbury | W.L. | 864 | 26 | 20 |
| | 30 | 4 | Moville P. Farm | Hillary | W.L. | 850 | 7 | 20 |
| | 27 | 5 | Mrs. W. F. C. Johnson | Newton Park | W.L. | 842 | 6 | 34 |
| | 26 | 6 | Jabula P. Farm | Witfield | W.L. | 831 | 34 | 35 |
| | 32 | 7 | Oliphant P. Farm Ltd. | Que Que | W.L. | 797 | 21 | 30 |
| | 29 | 8 | Lindisfarne P. Farm | Bulawayo | W.L. | 792 | 18 | 17 |
| | 40 | 9 | Willow Valley P. Farm | Steynsrust | W.L. | 778 | 1 | 6 |
| | 28 | 10 | V. A. Lawrence | Salisbury | W.L. | 771 | 12 | 37 |
| | 24 | 11 | Gables P. Farm | Bulawayo | W.L. | 767 | 11 | — |
| | 33 | 12 | Roseleigh Farm | Elandsfontein | W.L. | 736 | 14 | 44 |
| | 35 | 13 | L. Saunders | Twyfelspoort | W.L. | 732 | 64 | 104 |
| | 22 | 14 | Eddystone Stud P. Yards | Bulawayo | W.L. | 681 | — | — |
| X | 36 | 15 | Silver Oak P. Farm | Bulawayo | W.L. | 665 | 57 | 92 |
| XXX | 39 | 16 | Fairholm P. | Umtali | W.L. | 470 | 1 | — |
| | 34 | 17 | Sanda P. Farm | Salisbury | W.L. | 418 | 18 | 43 |
| XXX | 23 | 18 | Fairholme P. Farm | Umtali | W.L. | 337 | 4 | 23 |
| XXX | 25 | 19 | E. E. C. Green | Bulawayo | W.L. | 290 | 17 | 35 |
| | | | | | | 13,431 | 327 | 589 |
| | | | | | | 28,111 | 756 | 1,075 |

**Total number of eggs = 29,942**

## Section II—Individual Birds

(Positions are calculated on the total number of 1¾ oz. and over eggs for the first two periods, and subsequently on the total number of 2 oz. and over eggs laid.)

### HEAVY BREED SECTION

| *Bird* | *Posn.* | *Owner* | *Residence* | *Breed* | *Results* 1/3/49-30/1/50 | | |
|---|---|---|---|---|---|---|---|
| | | | | | A | B | C |
| 696 | 1 | MRS. G. E. WELLS | Salisbury | R.I.R. | 307 | — | 1 |
| 675 | 2 | D. MAYGER | Bulawayo | R.I.R. | 261 | — | — |
| 680 | 3 | NORFOLK POULTRY FARM | Odzi | R.I.R. | 247 | — | — |
| 650 | 4 | J. A. van Niekerk | Inyazura | B.Aust. | 239 | 2 | 5 |
| 652 | „ | T. B. Wright | Highlands, C.P. | B.Aust. | 239 | 2 | 1 |
| 615 | 6 | Gables P. Farm | Bulawayo | B.Aust. | 233 | 1 | 1 |
| 701 | 7 | Glenaholm P. Farm | Pietermaritzburg | R.I.R. | 229 | — | 3 |
| 605 | 8 | Eddystone Stud P. Yards | Bulawayo | B.Aust. | 219 | 10 | 16 |
| 607 | 9 | Alan V. Bauer | Kingwilliamsto'n | B.Aust. | 216 | — | 5 |
| 621 | 10 | Mrs. E. T. Hitchcock | Bulawayo | B.Aust. | 194 | 2 | 2 |
| 636 | 11 | Mrs. N. A. L. Parsons | Salisbury | B.Aust. | 192 | — | 1 |
| 665 | 12 | Gables P. Farm | Bulawayo | R.I.R. | 167 | 2 | 3 |
| 692 | 13 | Vicdale P. Farm | Dalview | R.I.R. | 150 | 1 | 2 |
| 631 | 14 | L. S. Maree, Eeram | Vlielkraal | B.Aust. | 132 | 37 | 47 |
| 686 | 15 | Sanda P. Farm | Salisbury | R.I.R. | 131 | 9 | 13 |
| 641 | 16 | Sparrenhof Farm | Benoni | B.Aust. | 124 | — | — |
| 616 | 17 | Hetkruis P. Farm | Steynsrust | B.Aust. | 122 | — | — |
| 630 | 18 | Lindisfarne P. Farm | Bulawayo | B.Aust. | 96 | 13 | 14 |
| X 666 | 19 | V. A. Lawrence | Salisbury | R.I.R. | 78 | 6 | 15 |
| 683 | 20 | A. W. Peters & Sons | Cambridge, C.P. | R.I.R. | 63 | 77 | 68 |
| 657 | — | Eddystone Stud P. Yards | Bulawayo | R.I.R. | 3 | 1 | 1 |

### LIGHT BREED SECTION

| *Bird* | *Posn.* | *Owner* | *Residence* | *Breed* | A | B | C |
|---|---|---|---|---|---|---|---|
| 791 | 1 | FAIRHOLME POULTRY FARM | Umtali | W.L. | 243 | — | — |
| 746 | 2 | MOVILLE POULTRY FARM | Hillary | W.L. | 229 | — | 1 |
| 777 | „ | SILVER OAK POULTRY FARM | Bulawayo | W.L. | 229 | — | — |
| 728 | 4 | Jabula P. Farm | Witfield | W.L. | 223 | — | — |
| 760 | 5 | Oliphant P. Farm Ltd. | Que Que | W.L. | 222 | — | — |
| 785 | 6 | J. A. van Niekerk | Inyazura | W.L. | 216 | — | 1 |

| *Bird* | *Posn.* | *Owner* | *Residence* | *Breed* | *Results* 1/3/49-30/1/50 | | |
|---|---|---|---|---|---|---|---|
| *LIGHT BREED SECTION—continued* | | | | | | | |
| 745 | 7 | Lindisfarne P. Farm | Bulawayo | W.L. | 208 | — | — |
| 786 | 8 | B. C. Waller | Salisbury | W.L. | 202 | 8 | 18 |
| 774 | 9 | L. Saunders | Twyfelspoort | W.L. | 190 | — | — |
| 717 | 10 | Gables P. Farm | Bulawayo | W.L. | 188 | — | — |
| 751 | 11 | T'Choma P. Farm | Salisbury | W.L. | 187 | — | — |
| 797 | „ | Willow Valley P. Farm | Steynsrust | W.L. | 187 | — | — |
| 735 | 13 | Mrs. W. F. C. Johnson | Newton Park | W.L. | 167 | 2 | 6 |
| 761 | 14 | Roseleigh Farm | Elandsfontein | W.L. | 110 | 4 | 6 |
| 710 | „ | Eddystone Stud P. Yards | Bulawayo | W.L. | 110 | — | — |
| 738 | 16 | V. A. Lawrence | Salisbury | W.L. | 107 | 1 | 1 |
| 767 | — | Sanda P. Farm | Salisbury | W.L. | 156 | — | 3 |
| X 725 | — | E. E. C. Green | Bulawayo | W.L. | 108 | 26 | 36 |
| X 711 | — | Fairholme P. Farm | Umtali | W.L. | 4 | — | 6 |

X denotes death

*Chief Poultry Officer*—G. H. COOPER
*Recorder*—A. P. De SATGE

# A Guide to Prospective Tobacco Growers

By J. C. COLLINS, B.Sc. (Edin.)
Tobacco Officer

So many requests are being received for information on the prospects of the tobacco industry, on how to gain experience in the production of the crop, and on how to proceed in the selection of a suitable farm, that these notes are being published in the hope that they will serve as a useful guide to prospective growers.

**Types and Classes of Tobacco and Market Prospects.** Flue-cured Virginia, Turkish type tobacco, Fire-cured Virginia, and small acreages of sun and air-cured Virginia, and of cigar leaf, are all grown in the Colony, but when one talks of becoming a "tobacco farmer" the emphasis is usually on the production of flue-cured Virginia.

At present the demand for sun and air-cured Virginia, and for cigar leaf is very limited, and so prospective growers are not advised to plant these crops, unless satisfactory marketing arrangements have been made beforehand.

The fire-cured Virginia industry is a long established one, and forms a most excellent side-line crop for maize growers in suitable localities. It is sold over the tobacco auction floors in Salisbury, and during the last two seasons, averaged 18.48 and 17.58 pence per pound, which are considered fair prices for this particular type of leaf.

Growers have the option of exporting their own tobacco on consignment, but for many years now no one has availed himself of this alternative, as the auction system works most smoothly and efficiently and to the satisfaction of all concerned.

Many continental countries have devalued their currencies to bring them more or less into line with the pound sterling, and this has resulted in an increased demand for fire-cured tobacco from the sterling or non-dollar areas. Italy is rapidly taking advantage of the position to gain a foothold in these markets, but she cannot hope to satisfy the full demand for many years yet, and, in the meantime, the Southern Rhodesian Fire-Cured Growers Committee is also anxious to enter the field, and for this purpose is encouraging increased production.

The Turkish tobacco industry has experienced many ups and downs, which is most unfortunate as the soils and climate are particularly well suited to the production of leaf of excellent quality. The reverses have been mainly due to two reasons, firstly, at one time there were too many channels for marketing a relatively small crop, which, of course, had the effect of restricting price competition, and secondly, growers have been detracted from Turkish by the high prices obtaining for flue-cured Virginia.

The first fault has now been remedied by the promulgation of the Turkish Tobacco Act, 1948, which regulates that all Turkish tobacco grown in the Colony shall. be sold through the Turkish Tobacco Co-operative Company of Rhodesia, Ltd., which is the growers' own co-operative organisation. A grower wishing to export his own tobacco direct, can only do so under a written permit issued under authority of the Minister of Agriculture.

The second causative factor for the reverse of the industry is righting itself, as, with the changed situation in international finance and the firm demand for leaf by the American Continent, the price for the 1948/49 crop is expected to exceed previous price levels. Furthermore, the Co-operative Company has requested the Government to introduce a support price in such a manner that a minimum price will be fixed for each grade, and will be guaranteed by the Government. The scheme has not yet reached finality, but the Company's request is being sympathetically considered by the Government.

The Turkish Tobacco Co-operative Company has its warehouse at Darwendale, where it accepts baled leaf on the string, for grading, manipulation, fermentation and marketing, so that all the farmer has to do is to grow and cure the leaf and despatch it to the Company, who pay him a cash advance of approximately eighty per cent. of the estimated value of the consignment, and pay the balance at a later date after deducting their charges.

In addition to manipulating and marketing the crop for the grower, the Company purchases at reduced prices, on behalf of its members, certain farm commodities associated with the production of the crop, and also assists with advice on technical matters. Technical assistance, is of course, also rendered by the officials of the Department of Agriculture.

Turkish is a dollar-earning commodity as most of the better grades find a ready market in the United States of America and in Canada. From both these countries the demand for Rhodesian leaf is greater than the supply, and the Co-operative Company therefore has the support of the Government in its endeavour to increase production.

The great advantage with the production of Turkish tobacco is that it requires but little overhead capital expenditure. The crop is cured on racks in the sun, and the only building necessary is a storage shed. The provision of a conditioning pit does much to facilitate handling, and can be constructed very cheaply. Turkish fits in well with a general farming programme when native women and juveniles are readily available, and it also forms a remunerative crop for plot-holders.

With regard to flue-cured Virginia, suffice to say that it is now the principal revenue producing commodity in Southern Rhodesia, and that, as far as one can foresee, the prospects of the industry are bright.

There is in existence a long term agreement between the Tobacco Marketing Board of Southern Rhodesia and the Tobacco Advisory Committee to the Board of Trade in London, whereby, on the assurance that, given favourable conditions, a crop of 140 million lbs. might be achieved by 1954, the Committee has agreed to purchase two-thirds of the Rhodesian production up to a crop of 140 million lbs., subject to tobacco of suitable quality being available at reasonable prices. The 1948-49 crop amounted to 81¾ million pounds weight.

In the event of there being a further appreciable fall in United Kingdom consumption (and an appreciable fall is regarded as being at least 20 per cent), it has been agreed that the Committee would would take not less than 57 per cent. of the crop over the period 1950 to 1954.

Although the agreement provides for a renewal of consultations from year to year, with a view to settling each year a provisional five-year programme (which at present takes us up to 1954), the Committee has recently undertaken to purchase a minimum of 75 million pounds weight in each of the two extra years 1955 and 1956.

These additional two years have been conceded by the Committee in order to give Southern Rhodesian growers an additional sense of security, enabling them to see seven years ahead instead of five.

Flue-cured Virginia is sold over two tobacco auction floors in Salisbury. Growers are also permitted to export their own produce under permit, but never more than one or two persons consign more than a proportion of their crop in this manner. The auction floors are the epitome of efficiency, competition between buyers is keen, and the grower can walk away with a cheque in full payment of his consignment within a few moments of the sale having been completed.

Summing up therefore, the prospective settler on the land will see that at present there is only a limited demand for sun and air-cured Virginia and for cigar leaf, but that there is a definite drive on foot to increase the production of flue-cured Virginia, fire-cured Virginia, and Turkish type tobacco. The drive is not only for increased production but also for improvement in quality. Our position on the world markets can only be assured by supplying those markets with good quality leaf, and this brings us to the next point, the question of experience.

**How to Acquire Experience.** Tobacco is a specialised crop, and, though cultural operations do not differ fundamentally from those prescribed for other agricultural crops, no one is advised to go in for flue-cured tobacco without first gaining a proper insight into the growing and curing of it. It is all very well to rely on the promises of neighbours to assist with technical advice, but curing time is a busy time, and it is not reasonable to expect more than very limited assistance from your fellow growers. Furthermore, methods differ greatly, and unless you are in a position to judge right from wrong, you are going to be confused by a diversity of advice from the people you meet.

The curing of Turkish and of fire-cured Virginia is relatively simple, and a pre-knowledge of the crop, though helpful, is not essential.

Unfortunately, there is no established training organisation, though in the future it is hoped to include tobacco culture in the curriculum of the Gwebi Agricultural College.

At present there are two methods of gaining experience, the one is by employing an experienced manager and learning from him, and the other is by going as a pupil or learner-assistant to an experienced tobacco grower.

For a prospective pupil or learner-assistant, the most satisfactory way of getting into touch with an experienced grower, is to insert an advertisement in the weekly (Friday) issue of the "Rhodesia Herald," (postal address): "The Rhodesia Herald," Stanley Avenue, Salisbury.

**Economics of Tobacco Production.** Unfortunately, no very accurate figures are available in regard to costs of production, but it is generally agreed that the following are a fair approximation, at present day price levels, and cover all phases of the crop from seed-beds to marketing and include overheads.

| | |
|---|---|
| Flue-cured Virginia ...... | £37/10/0 per acre |
| Fire-cured Virginia ...... | £20 to £25 per acre |

It is emphasised that these figures are only intended as rough guides, as costs of production vary greatly betwen growers.

No figure has been quoted for Turkish, as usually the acreage is small in comparison with that planted to other crops on the farm, and the cost of production is therefore largely dependent upon the precise role of the crop in the general economics of the farm. The average selling price realised over the last two seasons was in the neighbourhood of 21.5 pence per pound.

The average yields per acre and selling prices per pound, realised over the last three seasons for flue-cured and fire-cured leaf, are summarised below:

| | Flue | | Fire | |
|---|---|---|---|---|
| | lb. per acre | pence per lb. | lb. per acre | pence per lb. |
| 1946/47 ... | 638 | 29.12 | 668 | 14.55 |
| 1947/48 ..... | 673 | 32.55 | 636 | 18.39 |
| 1948/49 ... | 636 | 31.86 | 502* | 17.56 |
| Average ..... | 649 | 31.18 | 602 | 16.83 |

* The fire-cured areas suffered from a severe drought during the 1948/49 season

Based on this data, the nett revenue per acre is in the region of £47 for flue-cured Virginia, and £20 for fire-cured Virginia.

To view the matter in its true perspective, it must be fully realised that Turkish and fire-cured Virginia can only be regarded as side-line, or subsidiary crops, whereas flue-cured Virginia is, normally, the principal crop on the farm.

Apart from the question of finance, there are other factors which must be taken into account; for instance, the effect of tobacco on the other crops included in the rotation, and on the utilisation to the full of the labour force on the farm. Whenever tobacco immediately precedes maize in the rotation, the yield from the latter is almost invariably greater than it is when the maize follows most other non-leguminous crops.

**Areas of Production.** In Southern Rhodesia, tobacco is normally grown between altitudes of 2,500 and 5,000 feet, though attempts are being made to grow it at higher levels, but without much success, except in very sheltered localities. It is susceptible to frost, and once the nights become really cold, curing is rendered very difficult. The growth is never the same when it is grown in exposed areas.

As far as rainfall is concerned, the evenness of the distribution over the growing season is of greater importance than the total precipitation. The bulk of the crop is grown within the 30 to 35 inch belt.

The different classes of tobacco require different soil conditions. The production of flue-cured Virginia is confined to the pink, brown, grey and white sandy soils of granite and sandstone origin, and to the lighter types of pinkish sandy clay loams. Turkish is more or less similar in its requirements, but will tolerate a somewhat heavier soil. Fire-cured tobacco, on the other hand, requires good heavy soil, the typical maize soils, so that the best results are obtained from red, brown and black clay loams, and from fertile fine-grained sandy clay loams of the same colour range.

The combination of the three factors, altitude, rainfall, and soil, has therefore resulted in production being limited to Mashonaland and to part of the Midlands. It has been established that Turkish tobacco of good quality can be grown in parts of Matabeleland, but unfortunately the crop has not caught on there. Good quality flue-cured leaf has also been produced in that province, but the incidence of the rainfall is too uncertain to warrant production of this highly capitalised crop.

At present the fire-cured crop is centred around Shamva and Bindura, but there is no reason why this particular class of leaf should not be grown successfully in other heavy soil maize-producing areas. It has withstood the drought remarkably well during the last three seasons, and has been the financial saviour of many maize farmers.

Turkish can be grown in most parts of Mashonaland, but, in the main, the areas are the same as for flue-cured leaf. It is not feasible to define the flue-cured areas very closely, as, in certain districts where the crop is grown, there are localities which are not suited to the production of bright leaf, but, taken by and large, the principal areas are centred around Odzi, Inyazura, Rusape, Headlands, Macheke, Salisbury, Darwendale, Trelawney, Banket, Sinoia, Karoi, Concession, The Umvukwes, Glendale, Bindura, Darwin, Mtoko, Mrewa, Norton, Makwiro, Gadzema, Beatrice, Enkeldoorn and Gutu. The crop is also being grown around Umtali, Penhalonga, Umsweswe, Que Que, Gwelo and Umvuma.

The information contained in the table below has been extracted from the "Report on the Agriculture and Pastoral Production of European Farmers, Southern Rhodesia"; 1947/48; compiled and issued by the Agricultural Section of the Central African Statistical Office.

### TOBACCO GROWERS BY TYPE OF TOBACCO, 1947/48

| District | Virginia Tobacco | | | Turkish Tobacco |
|---|---|---|---|---|
| | Flue | Fire | Other | |
| Nyamandhlovu | — | — | — | 1 |
| Bulawayo | 1 | — | — | 2 |
| Bubi | — | — | — | 2 |
| Gwelo | 13 | | — | 4 |
| Selukwe | 3 | — | — | 5 |
| Victoria | 9 | 1 | 1 | 3 |
| Chilimanzi | 6 | — | — | 2 |
| Hartley | 159 | 1 | — | 31 |
| Lomagundi | 322 | — | — | 187 |
| Mazoe | 182 | 35 | — | 55 |
| Salisbury | 241 | — | — | 38 |
| Marandellas | 160 | — | — | 14 |
| Charter | 31 | — | — | 10 |
| Gutu | 15 | — | — | 17 |
| Ndanga | — | — | 1 | 1 |
| Melsetter | 13 | — | 4 | 1 |
| Umtali | 100 | — | 1 | 8 |
| Makoni | 171 | 1 | — | 18 |
| Inyanga | 2 | — | — | 2 |
| Mrewa | 66 | — | — | 9 |
| Mtoko | 11 | — | — | 4 |
| Darwin | 13 | — | — | 3 |

**Buying a Farm.** When inspecting a farm with a view to purchase, consideration must be given not only to altitude (with particular regard to exposure), rainfall and soil, but also to certain other essential requirements. Briefly, they are:

(1) **Timber.** For the curing of flue- and fire-cured tobacco, large quantities of firewood are needed, and preferably, therefore, the farm should be well wooded. If timber is scarce, coal-burning furnaces can be utilised for flue-curing, but then again the question of the availability of supplies of coal and of the cost of transport must be considered.

(2) **Water.** There must be a permanent supply of water on the farm, and enquiries should be made as the volume normally available between September and December, as seed-beds are prepared and sown during that period, and require a large and constant supply of clean water.

Many of the rivers and streams in this country are recognised sources of introduction of eelworm into the seed-beds and thence into the fields, and for this reason boreholes and wells are to be preferred. By no means should this comparison be taken to condemn a farm because surface water is the only source of supply, as, with the aid of precautionary measures, the chances of introducing eelworm to the farm, via the water, can be greatly reduced.

(3) **Extent of Arable Land Available.** Having in the back of your mind the type of farming you are going in for, you should calculate your soil requirements for the main crop, and so decide whether the particular farm you are viewing will provide sufficient land each season for the intended maximum acreage. As a very rough guide, a seven-course rotation should be considered on sandy soil when flue-cured tobacco is to be the principal crop. This is based on a rotation of tobacco, tobacco, maize, green manure crop and three years of grass.

(4) **Soil Fertility.** There are many farms on the market today which are only being disposed of because the fertility of the soil has been so impaired, that the present owners no longer find it sufficiently remunerative to continue to run them, and so are selling while land is fetching high prices.

In many instances such farms can be brought back into good heart by the application of the principles of good field husbandry, but this is generally a long-drawn-out task, and a would-be buyer is advised to probe well into the economics of the particular proposition and see whether he will have both the ground and the money to allow certain fields to revert to natural veld, or to be sown to green manure crops and grasses for a number of seasons, instead of growing cash crops straight away.

Low yields and poor prices are often attributable to severe eelworm infestation. There are very few old established farms which can claim complete freedom from this pest, but beware of farms on which the infestation is universal.

The way to satisfy yourself on this point, is to look for galls on the roots of tobacco plants. In cases of severe infestation they will be readily visible even on the withered roots of plants which have been unrooted some months previously.

(5) **Transport Facilities.** This is another factor for consideration when deciding on the choice of a farm. If rail and public road transport facitiles are not available, it means having to make your own haulage arrangements which generally work out more expensive and less convenient.

**Farm Valuation.** The average tobacco farm is about 2,500 acres in extent, and current prices range from twenty-five shillings to £10 or more per acre, being largely determined by the extent to which the farm has been developed, and on its proximity to railhead and to Salisbury.

When assessing the value of a farm it is not satisfactory to do this on the basis of a flat average price per acre, as in certain instances this is liable to be most misleading, particularly is this the case when the country is of broken formation, as here the percentage of unproductive land may work out to be greater than one imagines, with the result that the arable section becomes over capitalised.

The acreage should be analysed on the basis of its present and potential production. In other words it should be split up into:

(a) flue-cured soils;
(b) maize soils;
(c) pastoral areas; and
(d) non-pastoral outcrops and kopjes.

A value per acre should then be placed on each type. This figure will be influenced by soil fertility, and by the proximity of the farm to rail and road transport facilities, and by its nearness to Salisbury.

A separate valuation will then be made of the immovable assets, and also of the livestock and movable assets if these are being sold with the farm.

**Assistance: Financial and Technical.** On the promulgation of the Land Bank Act of 1947, the Land and Agricultural Bank of Southern Rhodesia virtually became the Farmers' Bank, as it now controls the issue of all Government loans to farmers, with the one exception that ex-servicemen assisted under the Land Settlement Scheme must look to the Land Settlement Board for any loans they may require.

" Generally, it may be stated that the Bank may assist bonafide farmers by making advances for the purchase, development and improvement of land and for the commencement or carrying on of farming operations. The bank has to be conducted strictly on business lines, and money can therefore be advanced only on approved security."

There are, of course, other financial organisations in the Country who will advance money on farming operations, but the new farmer is advised to consult the Land Bank first, as the terms offered are extremely generous.

Technical assistance in the form of advice on all phases and aspects of tobacco culture from soil selection and seed-beds to grading and marketing, can be obtained from the Tobacco Division of the Agricultural Department.

# Indigenous Tree Crops for Southern Rhodesia

By OLIVER WEST, D.Sc., M.Sc.
Senior Pasture Research Officer, Matopos Research Station

The importance of fodder reserves for the dry season is generally recognised, but the role which indigenous tree crops can play in providing dry season fodder is not as widely appreciated.

The Colony, together with the rest of Central Africa, is fortunate in possessing a very rich flora of pod-bearing leguminous trees, which, in their wild uncultivated condition, play an important part in the maintaining of stock over the long dry season.

If these trees were regarded as crop producing plants, and if they were to receive a fraction of the care devoted to the breeding, selection and improvement of the staple annual crops, they might be capable of revolutionising the entire agriculture of the semi-arid tropics. Their importance to the stock raising industry is obvious; their conservation value, while not so obvious is no less important.

At present the provision of supplementary dry season feed depends principally on the use of the plough, and although the provision by breeding and selection of drought-resistant annual crops for the semi-arid areas has made great strides, the provision of sufficient supplementary fodder for the dry season, normally not much less than ⅔ of the entire year, means that the proportion of ploughed land to natural veld must be large.

Experience has shown that extensive cultivation in arid and semi-arid regions almost invariably leads to the iniation of severe erosion. This is why the development of perennial tree crops for these highly erodable, low production, semi-arid regions may be so important. Important too is the fact that the trees listed are all leguminous. Recent work in Malaya has shown that under certain conditions leguminous trees exercise a beneficial effect on the grassland in which they grow and increase protein in the herbage (Jagoe, 1949).

It is the purpose of this article to note some of the more important crop-bearing trees which occur naturally in the vegetation of the Colony and which produce in their present unimproved condition large crops of highly nutritious pods.

These trees are:

*Acacia albida* Del.
mTungabayeni (Sindebele); mPumpu (Chikalanga).
*Acacia giraffae* Burch
mWohlo (Sindebele).
*Acacia woodii* Burtt Davy.
mLala Dwai (Sindebele).
*Acacia litakunensis* Burch.
(Singa mtshatshatsha (Sindebele).
*Acacia subalata* Vatke (= *A. benthami* Rochbr.).
Isanqawe (Sindebele).
*Dichrostachys glomerata* (Forsk) Chiov.
Ugagu (Sindebele)
*Piliostigma thonningii* (Schumach) Milne-Redhead.
Ihabahaba (Sindebele).

All of the trees listed produce large crops of edible pods. The pods possess in common a peculiar characteristic—they do not open to liberate the seeds, but fall to the 'ground intact as they mature during the dry season.

Lying on the ground they are sought out and consumed by game and stock. The pod and the spongy tissue which fills it is digested, but the seeds being hard and resistant to the digestive processes are passed out in the dung of cattle, and are, in this way, distributed in a remarkably efficient manner.

## ACACIA ALBIDA Del.

**Common Name:** Ana Tree (Transvaal).

**Native Names:** mTungabayeni (Sindebele); mpumpu (Chikalanga).

**Synonyms:** *Acacia gyrocarpa* Hochst; *Acacia saccharata* Benth; *Prosopis kirkii* Oliv.

A large tree with light grey, corky bark. Stipular spines, straight spreading, rather stout at base, usually not exceeding ½" to ¾".

Foliage, grey-green. Leaves oval, drooping, up to 8 cm. long with 3-8 pairs of pinnae. Pinnules, 6-8 mm. long, broadest near the apex, in about 15 pairs.

Inflorescence spicate, white or cream spikes axillary, solitary or geminate.

Widely distributed throughout tropical Africa from Zululand and the Northern Transvaal to the Anglo-Egyptian Sudan, Abyssinia and Somaliland.

*A. albida*, reaching a height of about 80 feet, is a magnificent tree, quite easily the largest of our native *Acacia* species and one of the largest trees found in the Colony.

In Southern Rhodesia it is a characteristic tree of the flood plains, banks and sandy beds of lowveld rivers. At altitudes of about 3,000 feet and under, it is common in this habitat and grows to a great size along most rivers where there is a sufficient depth of alluvium. On river flood plains it sometimes forms an open woodland community composed of impressive trees growing singly or in groups in tall grassland. Beautiful patches of this woodland can be found along the Manzimnyama on the Bechuanaland border and on the Sesami River in the Sebungwe District.

It is sensitive to frost, and trees which occur along the Khami River in the neighbourhood of Morgans, at about 3.500 feet, exhibit a peculiar growth form due to the killing back of branches by exceptional frosts.

Flowering begins very early in the dry season. Mr. Allan Tredgold has noted flowering in July on his farm Redleaf (Morgans). Flowering at lower altitudes is probably considerably in advance of this.

Ripe pods begin to fall from about August onwards depending on locality and season. I noted very heavy crops of mature pods on the Manzimnyama early in September, 1946. Mr. Tredgold gives November and December for Readleaf. Miss Steedman records ripe pods falling in the Sabi Valley in January.

The pods borne in clusters are large and usually curled and twisted. They are light brown or pinkish brown in colour and are of a crumbly biscuit-like texture. They may measure 5″ by 1½″, and are thick, containing much spongy tissue in which the seeds are embedded. Elephants are very fond of these pods.

There is no information about the quantity of pods yielded by *Acacia albida,* but large trees in good seasons probably produce about one ton of pods. (On Redleaf, where the tree is growing at the upper limit of its range, the yield is much smaller and in that locality *Acacia giraffae* gives larger yields.)

Seeds that have been kept for some time are quite easily germinated and there should be no difficulty about establishing this valuable tree wherever suitable habitat conditions exist. An interesting feature in the development of the seedling is the great length of tap root in proportion to the height of the aerial parts. In the sandy bed of the Sesami River seedlings 2-3″ tall were found to have tap roots exceeding 25″ in depth.

### **ACACIA GIRAFFAE** Burch.

**Common Name:** Camel Thorn.

**Native Name:** mWohlo (Sindebele).

**Synonyms:** *Acacia erioloba* E. Mey; *A. giraffae* Willd; *A. giraffae* Sieb. is a synonym of *A. seyal* Del ex Oliv.

A medium-sized to large tree, stipular spines, stout, brown, and straight up to 1¼″ long. Foliage, green. Leaves up to 6 cms. long with 1-3 pairs of pinnae. Pinnules about 5 mm. long, and nearly 2 mm. broad, in 8-15 pairs. Inflorescence, capitate yellow.

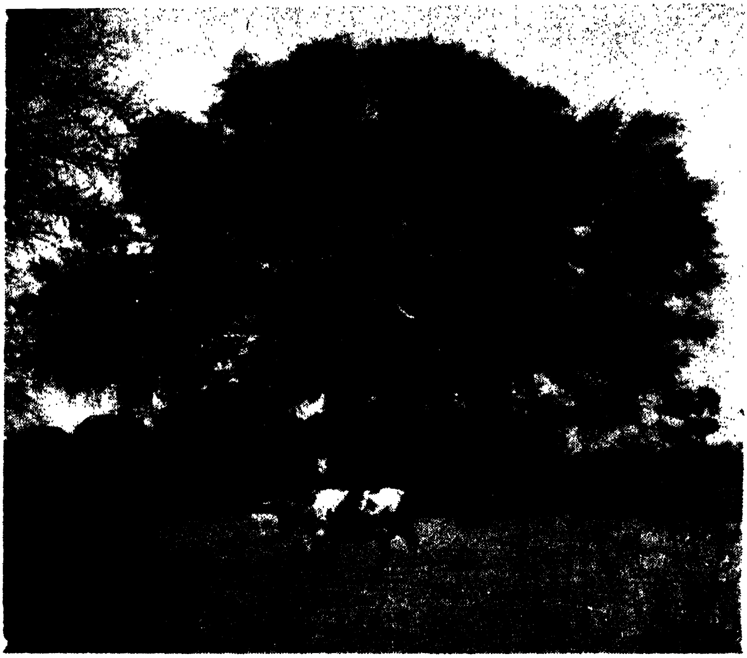
**Distribution:** Northern Cape, Free State in Hoopstad and Boshof Districts, Northern and Western Transvaal, Bechuanaland, Rhodesia.

*Dichrostachys glomerata (Forsk) Chiov.* A solitary shrub at the edge of dense thicket on "Two Tree Kop," Rhodes Matopo Estate.

A cleared pasture with scattered shade trees and an excellent grass cover. In this scene on the Rhodes Matopo Estate the trees are mostly *Acacia karoo*. A pod-bearing species would add materially to the amount and value of the food produced.

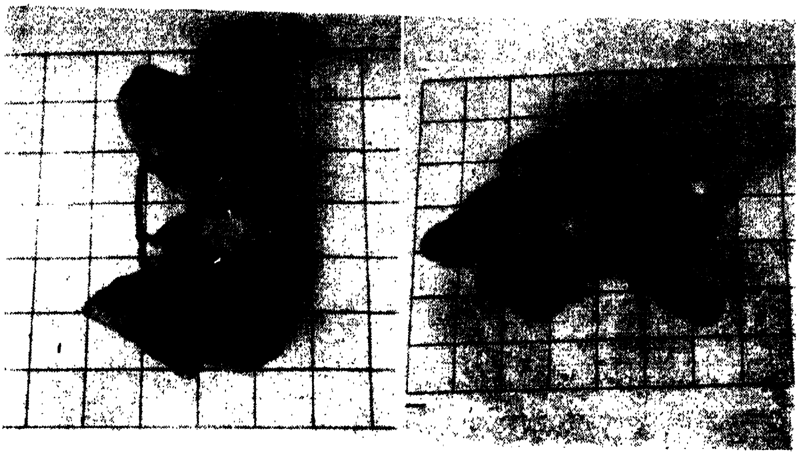
*Acacia woodii, Burtt Davy.* A picturesque group in granite sandveld near Fort Rixon.

The Bush Encroachment Problem.
A dense thicket of young *Acacia karoo* on the Rhodes Matopo Estate. Note the bare ground and incipient erosion.



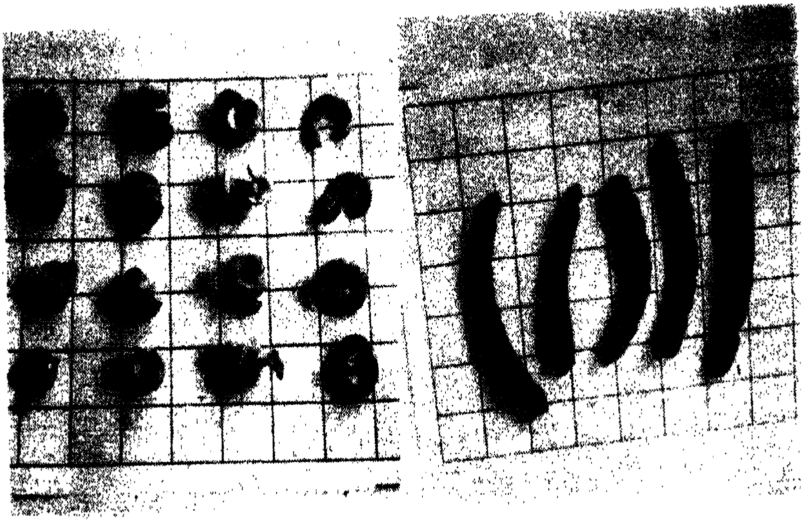
*Acacia albida Del.* A magnificent specimen on the banks of the Gwaai River, Gwaai Native Reserve. *Acacia albida* is the largest of our native acacia trees. It bears heavy crops of pods which are much sought after by elephant and other game as well as cattle.

***Acacia giraffae* Burch.** **A group of fine trees near the homestead on Mr. Allan Tredgold's farm "Red Leaf," Nyamandhlovu District.**

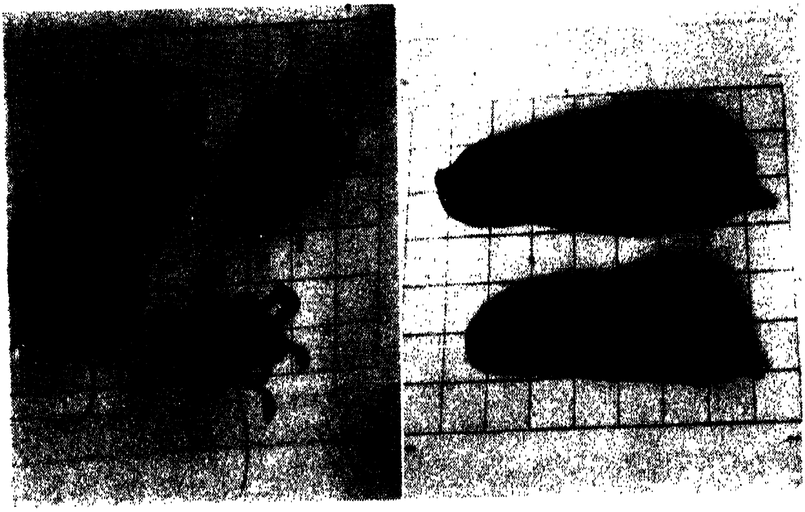


*Acacia albida Del.* (Squares are 1 inch x 1 inch.)

Left: *Acacia giraffae Burch.* (Squares are 1 inch x 1 inch.)
Right: *Acacia woodii Burt Davy.* (Squares are 1 inch x 1 inch.)



Left: *Acacia litakunensis Burch.* (Squares are 1 inch x 1 inch.)
Right: *Acacia subulata Vatke* (= *Acacia benthami Rochebr*).
(Squares are 1 inch x 1 inch.)



Left: *Dichrostachys glomerata (Forsk) Chiov.*
(Squares are 1 inch x 1 inch.)
Right: *Pilostigma thonningii (Schumach)* Milne-Red-Head.
(Squares are 1 inch x 1 inch.)

In Southern Rhodesia, the Camel Thorn is confined to the Western border of the Colony, extending eastward as far as the Shashi and Shashani Rivers in the South, and the Shangani in the North (Henkel, 1931).

In the South it is comparatively rare, but North of Bulawayo on the Kalahari and Forest Sandstone soils it is an important tree. On these deep soils it grows into a fine tree exceeding 40′ in height with boles up to 4′ in diameter, and a great spread of branches. On a recent tour of the Northern Cape the writer was struck by the fact that the average Camel Thorn there is considerably smaller than in this Colony.

Although the Camel Thorn is apparently tolerant of frost, it is very susceptible to, and easily killed by, fire. This is probably the reason for the stands of gnarled and gaunt, dead Camel Thorn trees so commonly found in Camel Thorn country.

Usually Camel Thorn thickets and groves are kept innocent of undergrowth, both by the dominance of the trees and the presence of animals, domestic stock and game, which are attracted by the browse and the pods. When, however, the growth of grass is encouraged by the coincidence of an exceptionally good season with the absence of animals, fires occur which kill stands of trees. A particularly striking example of this type of catastrophe can be seen at nGamo in the Gwaai Native Reserve.

Camel Thorn in some instances appears to pioneer for the Umgusi and Msasa Associations (Redwood and *Brachystegia*). Evidence for this view can be seen near the Senior Game Warden's house at Dett, where what was, some years ago, a grassy vlei, is rapidly becoming a dense Camel Thorn thicket as a result of protection from fire. Consocies of Camel Thorn trees surrounded by Umgusi are not infrequently found away from the vleis and valley bottoms.

When felled, Camel Thorn coppices freely from the stem, and unlike most *Acacias* it will sucker from roots.

It occurs almost invariably on deep alluvium or sand into which it sends a very long tap root. Henkel mentions examples of roots penetrating to a depth of 80 feet.

Flowering usually begins early in September (I have recorded a tree coming into flower on the 13th August, 1946, at Redbank), and ripe pods are shaken down in large quantities by the July winds.

The roughly falcate pods are thick and heavy and are covered with a dense grey felt. Although there is an almost infinite variety in their exact shape and size, the pods from any one tree resemble each other, and are distinguishable from the pods of any other tree. This fact which has not, I think, been recorded before, was first pointed out to me by Major Sharp, of Redbank.

Very little is known about the quantity of pods yielded by Camel Thorn trees. Major Sharp, of Redbank, measured one season's yield from two trees growing in his garden. The two trees together yielded 1,200 lbs. of pods. Mr. Tredgold, of Red Leaf, considers that six hundred pounds per tree is frequently exceeded, and mentions one tree from under which 30 bags of pods are collected year after year.

The yield of mature trees probably lies between ¼ and ½ ton. Mr. Tredgold considers that trees begin to produce their maximum yields when about 20 years old. Very old trees yield considerably less than trees in their prime.

### ACACIA WOODII Burtt Davy.

**Native Names:** nKamba (Zulu); mLala Dwai (Sindebele).

(*Acacia woodii* Burtt Davy and *A. lasiopetala* Oliv. are frequently confused. Miss Verdoorn writes:

> "These species were confused in herbaria until fairly recently, when I got the pods of *A. lasiopetala* and found they were very distinct from the large woody pods of *A. woodii*. They are narrow, moniliform and tomentose.")

A large tree with pale coloured bark flaking off in layers. Mature stipular spines straight and white. Young parts softly tomentose. Leaves up to 15 cms. long with up to 22 pairs of pinnae. Pinnules linear, about 4 mm. long and 1 mm. broad in 20-30 pairs. Inflorescence capitate white.

**Distribution:** Natal, Transvaal, Swaziland, Rhodesia, Nyasaland, Angola.

In Southern Rhodesia, *A. woodii* is widely distributed, but is nowhere very abundant. Fine trees occur singly or in small groups. It attains a height of 40-50′ with a stem diameter of up to 3′. The crown is umbrella-shaped or flat. The branches spread widely and provide a lot of shade. Flowering begins about November, and the pods mature about August-September.

The light brown pods are thick and flat about 6″ long by 1¼″ broad. The seeds 12-15 in each pod, are arranged in one row, and are embedded in spongy tissue. Despite their woody appearance, they are palatable, and greedily consumed by cattle.

Nothing is known about the quantity of pods yielded by *A. woodii*, but in a good season the crop from a mature tree is large and probably exceeds 500 lbs.

### ACACIA LITAKUNENSIS Burch.

**Common Name:** Haak en Steek (Transvaal).

**Native Name:** Singa Mtshatshatsha (Sindebele).

**Synonyms:** *A. heteracantha* Burch. (There is some doubt as to whether *A. heteracantha* Burch. is a good species. According to Burtt Davy the types are too poor to decide this, and investigation of the type localities (N. Transvaal, the Northern Cape and British Bechuanaland) is necessary; *A. spirocarpoides* Engl.; *A. spirocarpa* Hochst ex A. Rich.

[Brennan notes that "according to Burtt Davy, *A. spirocarpoides* Engl. is only separated from *A. spirocarpa* Hochst ex A. Rich. by having a glabrous, instead of pubescent, pod; all forms exist side by side, and are otherwise inseparable in the field, Christensen (in litt.) has suggested that the type specimen of *A. tortilis* (Forsk.) Hayne is actually *A. spirocarpa*.

If this is so, the plant here called *A. spirocarpa* should be called *A. tortilis*, and the plant usually called *A. tortilis* must bear the name *A. raddiana Savi.*"

Glover lists *A. tortilis* (Forsk) Christ. (non Hayne) as a synonym for *A. spirocarpa.*]

It is obvious that the taxonomy of this group included for convenience under *A. litakunensis* is most unsatisfactory. It is probable that only a simple species is involved, but this will not be decided until a study covering the entire geographical range of the group has been made.

Small to medium tree. Stipular spines 1-2½" long, straight and white, or curved short and brown. (Sometimes one of a pair straight and the other curved).

Leaves about 5 cms. long with about 10 pairs of pinnae. Pinnules very small and narrow in 7-15 pairs. Inflorescence capitate white.

**Distribution:** Natal, Western Free State, Northern Cape, and the Transvaal to Tanganyika.

In Southern Rhodesia, *A. litakunensis* is a common tree throughout the low, dry areas. It exhibits two distinct growth forms—in the one it is a shrubby, often dome-shaped, small tree with branches often coming right down to ground level; in the other, a tall, often flat-topped, tree. In favourable habitats on river banks and flood plains it grows very tall, exceeding 40' in height. Consocies of these tall trees are very picturesque and characteristically African in the Pierneef tradition.

I fancy that the shrubby growth form is confined to young trees and to trees growing in habitats not quite suited to the species.

*A. litakunensis* flowers about November. The pods ripen early, and the entire crop is usually dropped before the end of July. The pods are narrow, and very twisted, sometimes forming fairly symmetrical spiral coils. The ripe pods are pale brown in colour, and rattle when shaken. It is this rattle which has earned the tree its Native name.

The pods are very palatable and are so eagerly sought after by cattle and game that it is very difficult to gather any quantity. Nothing is known about the yield of pods.

The species often behaves as a pioneer in the invasion of grassland by bush. In old ploughed lands and other denuded areas in the Lowveld it tends to form dense thickets. For the maximum production of both tree pods and grass, the stocking of trees to the acre must be kept quite low.

### **ACACIA SUBALATA** Vatke.

**Common Name:** Lekkerreuk Peul (Transvaal).

**Native Name:** Isanqawe (Sindebele).

**Synonyms:** *Acacia benthami* Rochebr.; *A. arabica* Willd, var. Kraussiana Benth.

(Brennan considers that it is most satisfactory to include under *A. subalata* for the present Tanganyika Territory material previously named *A. benthamii* Rochebr. and *A. arabica* Willd, var. Kraussiana Benth.

He remarks that the taxonomy of this group is most unsatisfactory, and seems likely to remain so until an extensive study of it is made covering its entire geographical range).

A small, often flat-topped, tree with rough corrugated bark. Stipular spines nearly straight when old, but curved and pubescent when young. Pinnae in 3-12 pairs, usually 7-9: Pinnules linear-oblong, usually in 15-20 pairs. Inflorescence capitate yellow.

**Distribution:** Natal, Transvaal, Bechuanaland, Rhodesia and East Tropical Africa from Portuguese East Africa to Somaliland.

In the neighbourhood of Bulawayo *A. subalata* is very common on the heavier soils, but absent from the granite sandveld. It is a tree of the drier aspects, flat topland and stony hillsides, and it does not occur with *Acacia karroo* in the vleis and along river banks. It is widely distributed throughout the Colony. Well grown specimens are usually between 20 and 30′ feet tall. Usually flowering begins about November and continues for several weeks. The tree rarely makes a very bright show of blossom, never equalling *Acacia karroo* or any of the more spectacular species.

The crops of pods are usually well developed by mid-February and begin to fall early in the dry season. Usually the entire crop has been shed by the end of July.

The pods are about 6″ long by ¾″ broad, black, shiny and flat. They have a beaded appearance being much thickened over, and constricted between, the seeds.

A tree about 15′ tall in my garden yielded during the winter of 1947 a grain bag full of pods weighing 84½ lbs. This can, I think, be taken as an average yield for well grown trees in good seasons.

Like the majority of Acacia species *A. subalata* is a pioneer which invades grassland and tends to establish dense thickets.

## DICHROSTACHYS GLOMERATA (Forsk) Chiov.

**Common Names:** Chinese Lantern Tree; Sekel Bos.

**Native Name:** Ugagu (Sindebele).

**Synonyms:** *Dichrostachys nutans* Benth; *Acacia spinosa* E. Mey; *Caillea dichsrostachys* Guill; *Desmanthus divergens* Willd; *D. leptostachys* D C ; *D. nutans* D C ; *D. trichostachys* D C ; *Mimosa bicolor* Schum and Thorn; *M. sanguinea* Bruce.

A shrub or small tree up to about 12′ tall. Armed with stout, sharp-pointed spurs (modified branches) up to 2″ long, straight or slightly curved. 8-12 pairs of pinnae. Pinnules about 5-7 mm. long by 1.5-2 mm. broad, in 20-30 pairs. Inflorescence spicate, spikes resembling a tassel of numerous sessile flowers, sweet scented and showy. Lower flowers bright pink, upper ones yellow.

**Distribution:** Natal, Transvaal, Bechuanaland, Rhodesia and through tropical Africa to Somaliland.

*Dichrostachys glomerata* is a small tree or shrub with twisted branches and stout, straight, or slightly curved thorns.

It tends to form dense and impenetrable thickets, and as it, unlike most of the Acacia spps., suckers freely from the roots, it is most difficult to eradicate. Stumping trees established from seeds usually leads to a denser thicket of shrubs arising from root suckers.

Flowering usually begins in November. The pods are twisted and brown, and are borne in large bunches. They are much relished by cattle and game, particularly Kudu.

Nothing is known about the yield of pods.

**PILIOSTIGMA THONNINGII** (Schumach), Milne—Redhead.

**Common Name:** Bauhinia.

**Native Name:** Ihabahaba (Sindebele).

**Synonyms:** *Piliostigma pyrrhocarpum* Hochst; *Locellaria bauhiniodes* Welw; *Bauhinia thonningii* Schumach; *B. reticulata* G and P non D C; *B. pyrrhocarpa* Hochst; *B. abyssinica* A. Rich; *B. articulata* (err. typ. *Reticulatae* D C) Oliv. non D C.

A small tree with large, two-lobed, simple leaves, no thorns or spines. Flowers in racemes. The species is dioecious; that is, unisexual, male and female flowers occurring on different trees. For this reason it has been separated from Bauhinia.

**Distribution:** From Northern Zululand and the Transvaal to Abyssinia.

*Piloistigma thonningii* is very widely distributed in Southern Rhodesia. It flowers during the rainy season in January and February, and bears very heavy crops of large dark brown pods, which fall during the dry season, and can usually be collected in August.

There is no information about the yield of pod, but in proportion to the size of the tree it is undoubtedly very large.

## FEEDING VALUE OF THE PODS

The following tables indicate that the feeding value of the pods is not nearly as high as is commonly alleged:

## TABLE I

**Chemical Composition : Percentage of Dry Matter**

(From Russel, 1947)

| | | Moisture Content | Protein | | Ether Extract | Crude Fibre | N-Free Extract | Ash | | Ca. | P. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Crude | True | | | | Total | Sol. | | |
| *Acacia albida* | Pods | 9.2 | 10.5 | 9.8 | 1.4 | 26.7 | 57.7 | 3.6 | 3.4 | 0.65 | 0.23 |
| *Acacia giraffae* | Pods | 9.4 | 12.6 | — | 1.8 | 34.2 | 47.9 | 3.6 | — | 0.71 | 0.11 |
| *Acacia woodii* | Pods | — | 8.4 | — | 0.6 | 25.9 | 57.7 | 7.4 | — | — | — |
| *Acacia litakunensis* | Pods | — | 17.3 | — | 3.1 | 24.8 | 49.2 | 5.7 | — | 0.79 | 0.34 |
| *Acacia subalata (=A. benthami)* | Pods | 7.4 | 12.4 | 11.2 | 2.7 | 16.6 | 63.2 | 5.1 | 4.7 | 0.51 | 0.14 |
| *Dichrostachys glomerata* ...... | Pods | — | 11.4 | 9.3 | 1.2 | 25.6 | 56.4 | 5.5 | 5.1 | 0.51 | 0.20 |
| *Piliostigma thonningii* ...... | Pods | 4.7 | 6.8 | — | 2.4 | 23.7 | 63.8 | 4.9 | — | — | — |

## TABLE II

**Chemical Composition : Percentage of Dry Matter**

(From Russel, 1947)

| | Crude Protein | | Ether Extract | Crude Fibre | N-Free Extract | Total Ash | | Ca. | P. |
|---|---|---|---|---|---|---|---|---|---|
| *Acacia litakunensis* Whole Pods ...... ...... ...... | 17.3 | — | 3.1 | 24.8 | 49.2 | 5.7 | — | 0.79 | 0.34 |
| *Acacia litakunensis* Seeds ...... ...... ...... ...... ...... | 37.8 | — | 6.0 | 10.9 | 39.6 | 5.6 | — | 0.56 | 0.73 |
| *Acacia litakunensis* Pods without Seeds ...... | 8.7 | — | 1.6 | 34.3 | 49.4 | 6.2 | — | 1.10 | 0.14 |

## TABLE III

**Percentage of Digestible Nutrients and Starch Equivalents Dry Matter Basis**

(Mainly from Russel, 1947)

| | Crude Protein | Ether Extract | Fibre | Carbohydrate | S.E. |
|---|---|---|---|---|---|
| Ground Nut Cake (Undecort) ...... | 27.7 | 8.2 | 2.6 | 18.4 | 56.8 |
| Maize ...... ... ... .... . ... . . ... ... | 7.9 | 2.7 | 0.8 | 63.7 | 77.6 |
| English Meadow Hay. Good quality | 6.3 | 1.2 | 17.5 | 30.0 | 43 |
| Crested Wheatgrass Hay ...... ...... ...... | 1.94 | 0.34 | 19.23 | 26.06 | 37 |
| *Acacia albida* ...... ...... ... .. .. .. .. | 4.5 | 1.0 | 4.0 | 46.2 | 43 |
| *Acacia subalata* (=*A. benthami*) ...... | 6.6 | 2.2 | 3.2 | 50.4 | 56 |
| *Dichrostachys glomerata* ...... ... ... ... | 4.0 | 1.0 | 14.7 | 37.6 | 56 |

Table I gives the Chemical Composition of the whole Pods as Percentage of Dry Matter.

In Table II a comparison of the analyses of the whole pods, the seeds and the pods without seeds of *Acacia litakunensis*, show that the pods without the seeds are much less valuable than the whole pods containing seeds. When cattle consume whole pods, the seeds are not digested, but are passed out in the dung. Thus, if the full feeding value is to be obtained, it is important that the whole pods containing seeds should be ground in a hammer mill before they are fed. Unfortunately, digestibility data are available for only three of the species, i.e. *A. albida*, *A. subalata* (= *A. Benthami*) and *Dichrostachys glomerata*.

In Table III, these data are compared with digestibility data for ground nut cake, maize, good quality English meadow hay, and for Crested Wheatgrass hay. Crested Wheatgrass hay is probably comparable with the good Rhodesian Veld Hay cut on the Central Veld and Pasture Station for Matabeleland. As determined by chemical analysis the latter contains from 4 to 5 per cent total crude protein of which the digestibility coefficient is not yet known. (Much veld hay cut in the Colony is very inferior, showing total crude protein values as low as 1.9 per cent.)

The table shows that the feeding value of the pods is approximately equivalent to British meadow hay as sources of digestible protein and superior as sources of energy on a dry weight basis.

The pods are superior to good veld hay and very superior to ordinary veld hay, and to much of the dry grass forrage which provides the bulk of late dry season grazing. Their real value becomes apparent when they are considered in relation to the maintenance requirements of cattle. The maintenance ration of a 1,000 lb. steer should provide 6 lbs. of starch equivalent, including 0.7 lb. of digestible protein. This is provided by ± 14 lbs. of good English meadow hay according to the quality of the fodder and the individuality of the animal.

Rhodesian veld hay containing approximately ± 2 per cent. digestible protein, and with a starch equivalent of ± 37 is insufficient as a maintenance ration for all classes of cattle. If, however, veld hay is fed with an approximately equal weight of pod meal, the requirements for maintenance are satisfied. This is shown in the following table:

TABLE IV

| | Content in Lbs. D.W. Basis | |
|---|---|---|
| | Protein | Starch Equivalent |
| 10 lbs. (Dry Weight) Veld Hay | 0.2 | 3.7 |
| 10 lbs. (Dry Weight) *Acacia albida* pods | 0.45 | 4.3 |
| Total | 0.65 Lbs. | 8 Lbs. |
| 10 lbs. (Dry Weight) Veld Hay | 0.2 | 3.7 |
| 10 lbs. (Dry Weight) *Acacia subalata* pods | 0.66 | 5.6 |
| Total | 0.86 Lbs. | 9.3 Lbs. |
| 10 lbs. (Dry Weight) Veld Hay | 0.2 | 3.7 |
| 10 lbs. (Dry Weight) *Dichrostachys glomerata pods* | 0.4 | 5.6 |
| Total | 0.6 Lbs. | 9.3 Lbs. |

## YIELD PER ACRE

Our present knowledge of the quantities of pods yielded by the trees reviewed is meagre. With the exception of one season's measurement of the yield of two trees in the case of *Acacia giraffae* and one season's measurement of the yield of one tree in the case of *Acacia subalata* (= *A. benthami*) no definite information exists and nowhere has an attempt been made to measure the yield of trees over a number of seasons. Information is required too about the effect of different densities of stocking (number of trees per acre) on the quantity of pods yielded and on the growth of grass.

(From work carried out at Matopos and elsewhere it is known that in semi-arid bushland direct competition for water in the surface layers of the soil exists betwees the trees, shrubs and grasses, and that the growth of grasses is greatly improved when dense bush is thinned.)

Two separate aspects require detailed investigation and study:

(1) The growing of the trees in pure stands or plantations or as avenues, shelter belts, etc., etc.; and

(2) The replacement in suitable areas of less valuable trees and shrubs in the veld by the more valuable pod bearing leguminous trees at a sufficiently wide spacing to permit a growth of grass not much less than the optimum.

It is this latter aspect perhaps from which the greatest increase in production can be expected.

From field observations extending over a period of years it is considered that the large pod bearing trees including *Acacia albida*, *A. giraffae* and *A. woodii* could be grown in perennial grassland at a stocking rate of 4-8 large trees to the acre without causing a serious diminution in the yield of grass. The smaller trees including *Acacia litakunensis*, *A. subalata* (= *A. benthami*) and *Piliostigma thonningii* could be grown at 10-20 trees to the acre. At these stocking rates the yield of pods in a good season would lie between 2,000 lbs. and 4,000 lbs. per acre for the large trees and 500 lbs. and 1,000 lbs. per acre for the small trees. At a conservative estimate of one crop every two years, the average annual yield would be 1,000-2,000 lbs. per acre for the large trees and 250-500 lbs. per acre for the small trees.

When it is remembered that the average veld hay crop in the better grassed parts of Matabeleland (excluding vleis, seepage zones, etc.), lies between 500 and 1,000 lbs., the significance and importance of the possible pod yields can be realised.

Not only can they add very substantially to the bulk of fodder produced, making it possible to carry more stock to a given acreage, but they are capable of transforming what is an insufficient ration on which cattle lose weight and would eventually die, to a ration containing the requirements for maintenance. By increasing the carrying capacity and by preventing the usual loss during the dry season of a large proportion of the weight gained during the previous growing season, they can reduce the time required to produce slaughter stock and add very materially to the amount of beef produced each year. These are the obvious benefits. There may be other benefits which are not so obvious.

Work recently carried out in Malaya (Jagoe) encourages the hope that the leguminous trees in Africa may fufil to a certain degree the role played by the clovers in temperate countries. By supplying nitrogen they increase the yield and protein content of the grass around them. This is an important consideration, and, provided the density of growth is not too great, it may, in normal seasons, more than offset the losses caused by competition for water.

## PROPAGATION

It is important to realise that the species discussed probably do best and give their greatest yields in habitats to which they are naturally adapted (e.g., *Acacia albida* on deep alluvial flood plains in the low veld, *Acacia giraffae* on deep alluvium and sand in the Gusu areas. *Acacia woodii* on granite sands and other soil types under fairly high rainfall. *Acacia litakunensis* in fairly deep soils in valley bottoms in the dry low veld. *Acacia subalata* (= *A. benthami*) and *Piliostigma thonningii* on red soils in medium rainfall areas. *Dichrostachys glomerata* in comparatively frost-free localities in the medium and low rain areas).

In areas in which the species are at home it will not usually be necessary to go to the trouble of planting trees in order to obtain the proper stocking in cleared grassland. This can often be more easily affected in the first place by selective clearing and thinning of too dense bush. Some of the species, especially *Dichrostachys glomerata*, are potential thicket formers and should be kept in careful control.

All of the species produce quantities of good seed which is hard, but easily germinated, if first submitted to some preliminary treatment. In tests at Matopos the best results were obtained when the hard seed coats were notched with a file or abraded on an emery wheel. The abrasion or notch should be made at the end furthest removed from the micropyle. After germination the elongation of the radicle is very rapid and for this reason it is best to plant the seed in situ several to a hill. The seedlings can be thinned out afterwards. Very good results are obtained if the seeds are germinated in small compost pots easily made by means of a "plant tool." These pots are "planted" entire without disturbing the developing root system.

## ACKNOWLEDGMENTS

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# The Dairy Industry in Southern Rhodesia

By J. R. CORRY, B.Sc., Chief Dairy Officer

**General.** Southern Rhodesia does not possess the natural facilities for milk production which are found in other more favoured dairying countries such as New Zealand, parts of South Africa and Kenya. In the first place, the Colony has a highly seasonal summer rainfall which is usually confined to the four months of December, January, February and March. Furthermore, the rainfall is not only erratic, but is also of low efficiency over the greater part of the Colony, the average for about half the territory being less than 25 inches per annum. The natural pasturage is somewhat inferior, and, with few exceptions, inadequate for the maintenance of milk production for more that a few months of the year, supplementary feeding being usually necessary for six or seven months of the dairying season. A further limiting factor is cattle disease of which there is a fair variety—tickborne and other. Compensating factors which help to offset the disabilities referred to are firstly, a temperate climate which makes it practicable for dairy cattle to remain out day and night throughout the year, thus dispensing with the elaborate shedding required in colder countries; second, cheap land and cheap indigenous labour which although untrained and inefficient can be used under competent European supervision with a fair amount of success. Furthermore, despite its climatic and other disabilities, experience has proved that the territory is capable of supporting a thriving industry provided that development on these lines is restricted to areas suitable for the purpose.

**History.** In 1912, twenty-two years after the occupation of the territory by the pioneers, the Colony's first dairy factory, a creamery, was opened at Gwelo, an example which was followed a few years later by the establishment of two similar factories in Bulawayo. The first registered cheese factory was established in 1929, and the first milk pasteurising plant, a co-operative undertaking, in 1930, in Salisbury. Prior to 1912, all butter was either farm-made or imported, whilst until as recently as fifteen years ago, the bulk of the milk entering the fresh milk trade was distributed by producer-retailers.

The following figures show the production of milk, butter and cheese at five year intervals since 1920. Earlier figures are not available.

### TABLE I

### Dairy Production: 1920-1948

| Year | Butter | Cheese | Liquid Milk | Total |
|---|---|---|---|---|
| | 1,000 lbs. | 1,000 lbs. | 1,000 galls. | galls. |
| 1920 | 600 | 79 | 258 | 2,000,000 |
| 1925 | 1,396 | 130 | 621 | 4,800,000 |
| 1930 | 1,768 | 163 | 1,008 | 6;100,000 |
| 1935 | 1,393 | 333 | 1,453 | 5,700,000 |
| 1940 | 1,686 | 383 | 2,095 | 6,910,000 |
| 1945 | 1.224 | 702 | 3,848 | 7,750,000 |
| 1948 | 1,450 | 542 | 4,500 | 8,700,000 |

The total dairy production shown in Table 1 derives entirely from European-owned cattle. Milk production from native herds is at present negligible.

**Prospects for Dairy Farming in Southern Rhodesia.** On the whole, the outlook for the dairying industry seems fairly bright. At present, the Colony is a long way from producing sufficient dairy produce for its own requirements. This applies particularly to butter and cheese, whilst other products, such as dried milk and condensed milk are not being manufactured in the Colony at all. As far as butter is concerned, it is unlikely that the territory will be producing sufficient for its requirements for some years to come, whilst resumption of the trade with adjoining territories, which existed before the war, will probably not be possible without considerable expansion in the industry.

The fact that there is a shortage of dairy products in the territory, coupled with the steadily increasing demand for milk and its products, arising from the Colony's rapidly growing population, make it unlikely that Southern Rhodesia will be exporting dairy products for many years to come, and the industry will not, for that reason, be directly exposed to the possibly depressing effect of international prices. Viewed from this angle, the immediate future for dairying seems bright enough. There is obviously room, and need, for considerable expansion.

**Areas Suitable for Dairy Farming.** Dairying in some form or other is carried out in most parts of the Colony, although certain areas are more suitable for this type of farming than others. Generally speaking, the minimum requirements for successful dairy farming in this country are a fairly cool climate, good soil and a reliable rainfall of not less than 25 inches per annum. Rigid adherence to these physical controls, however, would probably restrict dairying in this Colony to altitudes of 3,500 feet and above, whereas there are exceptions to this rule.

As in most undertakings, the human element is an important factor, and a great deal depends on individual care, feed and management as well as intelligent adjustment of farming methods to suit the climatic and other controlling factors. As previously mentioned the natural pasturage is, on the whole, somewhat inferior, and supplementary feeding is usually necessary for seven or eight months of the dairying season, the feeds commonly grown for this purpose being hay—leguminous and other—silage, usually maize or sunflowers, and concentrates such as maize, beans, ground nuts, etc. The extent to which supplementary feed can be provided, and the acreage planted annually for this purpose, depends on the quality of the soil, rainfall, etc. As a rough estimate, however, it can be assumed that a dairy cow producing 500 to 600 gallons of milk in a lactation of 300 days or less will require as supplementary feed about 3 tons of silage, 1 ton of bean hay, and at least ½ ton of concentrates per anuum. This means that approximately 2 acres of land will require to be planted each year for feed for each cow in the herd.

If the natural grazing is exceptionally good, or where improved pastures can be laid down, this figure may be considerably reduced.

Notwithstanding the Colony's lack of natural facilities for dairying in the way of good pasturages, etc., it is possible, under conditions of good management and where adequate provision is made for supplementary feeding to maintain dairy herds of quite a high standard of production, i.e., an average herd of production of 700 to 800 gallons of milk per annum, is by no means uncommon, whilst these figures are frequently exceeded by individual cows. The following figures show the herd averages for cows recorded under the Southern Rhodesia Government Milk Recording Scheme since 1932, when the present scheme was introduced. (Figures are given for every second year only):

## TABLE II
### Government Milk Recording Scheme: 1932-1948

| Year | Total No. of cows tested | No. of completed lactations | Milk production lbs. | Butterfat production lbs. | % Butterfat | Days |
|---|---|---|---|---|---|---|
| 1932 | 1,397 | 479 | 3,694 | 138.5 | 3.75 | 224 |
| 1934 | 1,600 | 654 | 4,362 | 159.7 | 3.66 | 265 |
| 1936 | 2,959 | 1,460 | 4,483 | 148.7 | 3.32 | 277 |
| 1938 | 3,152 | 1,849 | 4,841 | 175.6 | 3.63 | 277 |
| 1940 | 3,070 | 1,472 | 5,098 | 191.4 | 3.70 | 281 |
| 1942 | 3,333 | 1,811 | 5,621 | 204.8 | 3.65 | 280 |
| 1944 | 5,380 | 2,462 | 6,252 | 231.9 | 3.71 | 283 |
| 1946 | 8,407 | 4,389 | 5,768 | 213.0 | 3.69 | 280 |
| 1948 | 9,025 | 4,699 | 5,807 | 216.6 | 3.73 | 278 |

(The Southern Rhodesia Government Milk Recording Scheme provides for the testing of grade as well as pedigree herds. The former are tested for butterfat once in every 60 days over a 24-hour check test period, while pedigree cows are subjected to a 48-hour check test once in every 30 days. The fee for testing grade herds is 10s. per visit, for which the owner can have up to 50 cows tested; for more than 50 cows the fee is £1. For pedigree herds the minimum charge is £1 per visit, and for this sum the owner may have ten cows tested; for each cow over this number the fee is 1s. per head. The actual testing of the milk is done by the Recorder at the farm, composite samples of the evening and morning milk being used in the case of grade herds.)

The most popular breed for dairying purposes is the Friesland—grade and pure-bred—although the Red Poll, Guernsey and Jersey are also favoured. All these breeds do well.

**Labour.** From a dairying point of view, the indigenous labour although cheap, is untrained, and consequently inefficient. Due to his low standard of living, and lack of knowledge and appreciation of the elementary principles of hygiene, the African is unable to grasp the significance of the various precautions which have to be taken in the production and handling of dairy produce. This is a distinct handicap, as so much of the dairy work is left to the African employee. Under constant supervision, however, the more intelligent African can be used with a considerable degree of success, and where farmers are prepared to exercise such supervision and training, satisfactory results can be anticipated. As above mentioned, African labour, although inefficient, is cheap, and can usually be procured for wages ranging from 25s. to 35s. or more per month, plus, of course, food, etc. The labour staff required for herding, milking, feeding, handling and transport of the milk and cream, etc., usually works out at about one African for every five cows, e.g., for a herd of 100 cows, a staff of approximately 20 Africans would be required; some of these would, of course, be used for other work on the farm besides the tasks mentioned.

**Dairy Buildings and Equipment.** Under the Dairy Regulations, every person selling dairy produce has to provide a suitable milking place, and a dairy. Under the climatic conditions which obtain in Southern Rhodesia, however, dairy cattle can remain out day and night throughout the year, and elaborate cow stables are therefore unnecessary. A simple lean-to shed where the cows can be milked and fed is quite satisfactory, and can usually be constructed quite cheaply; the milking place must have a cement floor and comply in other respects with the Dairy Regulations. The dairy, which usually consists of one or two rooms, can also be erected very cheaply—in fact, the writer has seen some very excellent small single-room dairies constructed for less than £20. All farm dairy equipment, such as utensils, boilers, steam sterilisers, etc., can be obtained without difficulty in the Colony. Drawings of dairy buildings, etc., can be obtained free of charge from the Chief Dairy Officer, Box 25, Causeway, Salisbury.

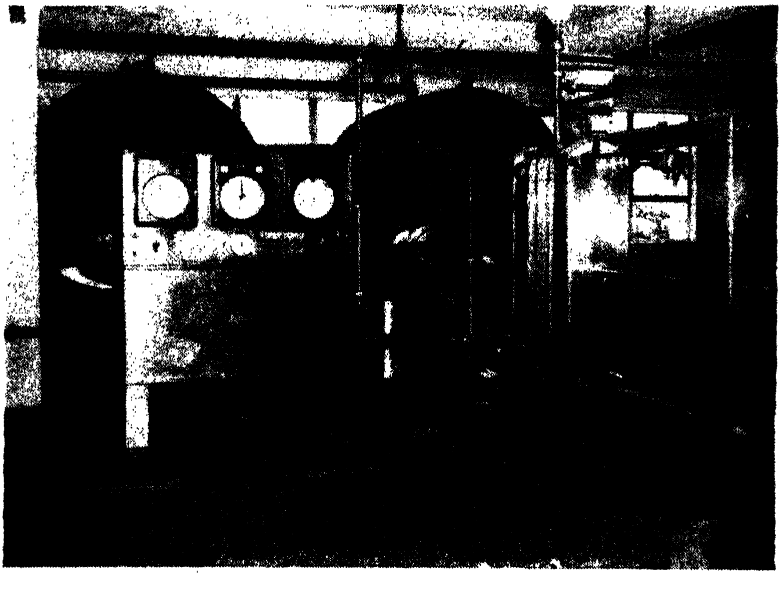
**Milking Machines.** Owing to the difficulty in obtaining good native milkers in the territory, dairymen are turning their attention to the possibilities of machine milking, and there is little doubt that in spite of the fact that they are somewhat costly to instal, milking machines will ultimately become an important factor in advancing the dairying industry in the Colony—in fact, as the dairy herds improve, they may become a necessity. Experiments have shown that they are economical to operate, have no appreciable effect on the yield or composition of the milk, and are unquestionably preferable to the average type of African hand milking.

**Markets for Dairy Produce.** Milk may be disposed of in the form of fresh milk if the farmer is near enough to a town or village to market his product in that form, or it may be supplied as whole milk to a cheese factory, or as butterfat to a creamery; it may also be converted into cheese by the farmer himself. The manufacture of butter on farms, however, is not encouraged —in fact, no farmer can make butter unless he holds a farm butter licence issued to him by the Dairy Industry Control Board. Newcomers to the industry have little hope of obtaining a licence to make farm butter unless they are so situated that they are unable to send their cream to a creamery. Producers who are situated within 12 miles of a thrice-weekly rail or road motor service are usually regarded as being able to send cream to a creamery and are not granted a licence to make farm butter.

The object of this measure is to encourage producers to send their cream to the creameries, which are properly equipped with the facilities necessary for the manufacture and storage of butter of uniform quality.

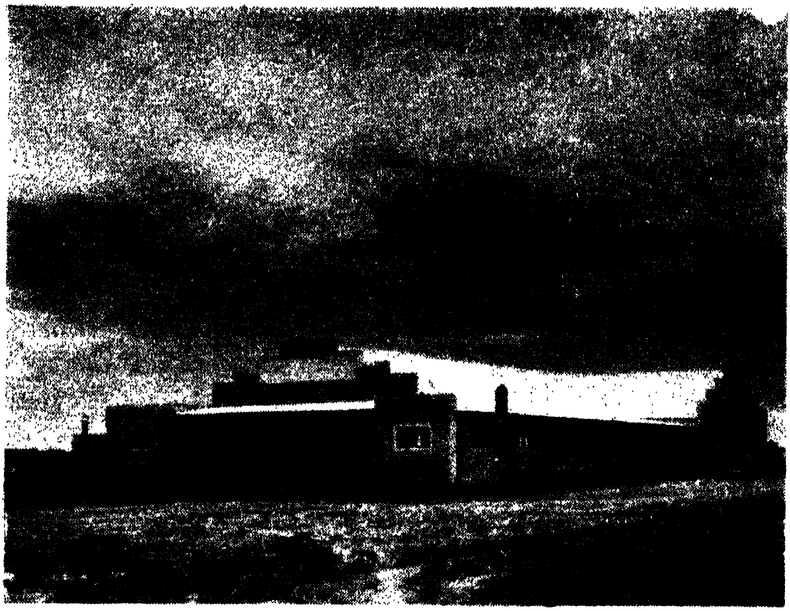
*The Rhodesia Co-op. Milk Coy.'s New Dairy at Bulawayo in course of construction.*

[Photo. by: Payne's Studios Ltd., Bulawayo.



*A.P.V. High Temperature-Short Time-Paraflow Pasteuriser, with Milk Tanks in rear, at the Rhodesia Co-op. Milk Coy.'s New Dairy, Bulawayo.*

[Photo. by: Payne's Studios Ltd., Bulawayo.



*The Gazaland Co-operative Cheese Factories new factory at Chipinga.*

[Photo by: E. T. Brown, Umtali.

*Weighing platform and cheese-making room at the Gazaland Co-operative's new cheese factory at Chipinga.*

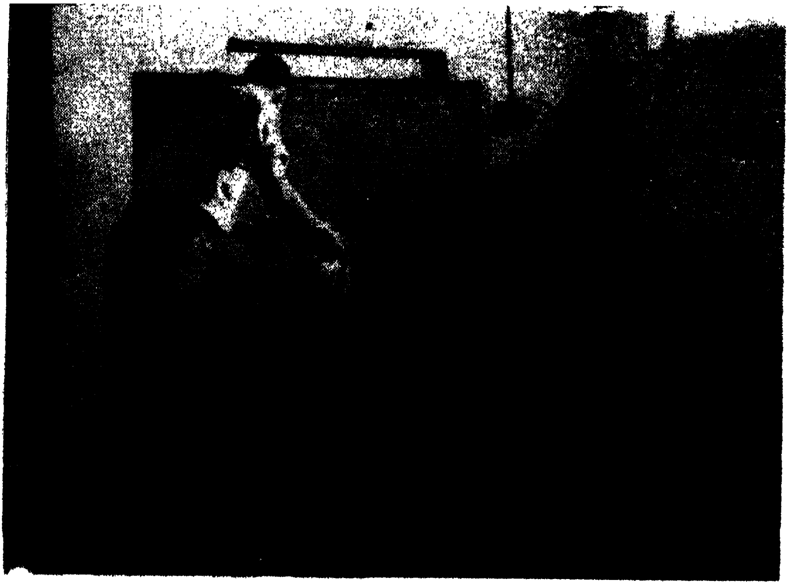
[Photo by: E. T. Brown, Umtali.

*Jersey Cows near Bulawayo. (Mr. S. Gilman, Bulawayo.)*
(Photo. by: Payne's Studios Ltd., Bulawayo.

*Friesland Cattle on Mr. J. Jamieson's farm, Criterion Dairy Farm, Bulawayo. This herd heads the official and semi-official herd aver- for* 1949 *with the following figures:—*
*Semi-official Test:* 11,054.3 *lbs. of milk containing* 362.2 *lbs of butterfat in* 297 *days.*
*Official Test:* 10,734.7 *lbs. of milk containing* 377.1 *lbs. of butter- in* 300 *days.*
(Photo. by: Payne's Studios Ltd., Bulawayo.

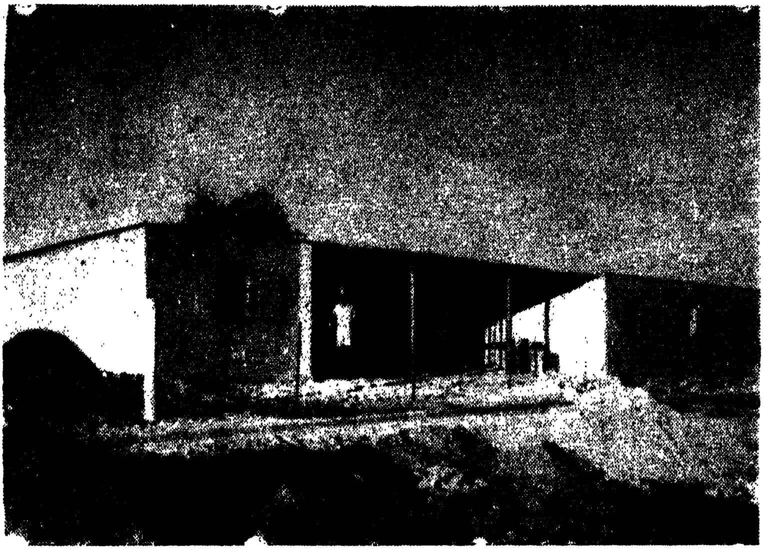
*Auto-Recorder-Releaser Milking Machine at Mr. H. H. Turner's Dairy, Springs, Salisbury.*

[Photo. by: J. R. Cooksey, Salisbury.



*Can Immersion Cooling Tank containing cold water, into which the filled milk cans are placed for cooling. Cooling of the water is effected by means of the small refrigeration unit shown in the illustration on top of the tanks. (H. H. Turner, Springs, Salisbury.)*

[Photo. by: J. R. Cooksey, Salisbury.



*Two views of Dairy Premises comprising feed room, milk weighing room, shower room for natives, wash-up and sterilising room for utensils, as well as a dairy room for cooling milk, etc., plus milking Mraandellas, at a cost of approximately £220.*

**Situation of Creameries and Cheese Factories.** There are five registered creameries in the Colony, one each at Umtali, Salisbury, Gwelo and Bulawayo and Chipinga. Of these, four are co-operative concerns. These creameries are well served in the matter of rail and road transport, and there are few areas from which cream cannot be delivered to a creamery in first grade condition—provided, of course, that it is produced and handled in the proper manner on the farm.

There are six cheese factories presently operating in the Colony; of these, one is situated at Chipinga, one at Fort Victoria, and one each at Umtali, Salisbury, Gwelo and Bulawayo. The Factories at Fort Victoria, Chipinga, Salisbury, Gwelo and Bulawayo are all co-operative. These factories, between them, manufacture over 95 per cent of the Colony's output of cheese.

The chief varieties of cheese made are Cheddar and Gouda, mainly the former. Roquefort cheese, familiar to most people as a blue-veined cheese, is made by the factory at Fort Victoria. In addition to these varieties, small amounts of soft cheese such as cream cheese, cottage cheese and certain other types are also made in the Colony.

As far as the fresh milk trade is concerned, this shows a strong co-operative trend. In both Salisbury and Bulawayo the bulk of the fresh milk sold is handled by co-operative companies owned by the producers, whilst in Gwelo and Umtali the organisation is even stronger, being 100 per cent. co-operative.

**Current Fixed Prices for Dairy Produce**

| | Summer | Winter | Average |
|---|---|---|---|
| | s. d. | s. d. | s. d. |
| **Milk** | | | |
| (Retail) Cash and Carry (per pint) | 4½ | 4½ | 4½ |
| Coupon (delivered) (per pint) | 5 | 5 | 5 |
| Credit | 5¼ | 5¼ | 5¼ |
| Bulk—per gallon | 2 10 | 2 10 | 2 10 |
| Price to Producer | 2 5½ | 2 9½ | 2 7½ |
| **Butterfat** | | | |
| 1st grade per lb. | 2 9 | 3 7 | 3 2 |
| **Butter** | | | |
| 1st grade per lb. (wholesale) | 3 2 | 3 2 | 3 2 |
| 1st grade per lb. (Retail) | 3 6 | 3 6 | 3 6 |
| **Cheese** | | | |
| 1st grade per lb. (wholesale) | 2 5 | 2 5 | 2 5 |
| 1st grade per lb. (Retail) | 2 9 | 2 9 | 2 9 |
| **Cheese Milk** | | | |
| (No fixed price) per gallon | 1/- to 1/6 | 1/4 to 1/8 | 1/3 to 1/6 |

In addition to the fixed price for butterfat, the creameries usually pay a small bonus, ranging from 1d. to 3d. per lb. There is also the Special Dairy Bonus of 4d., referred to in the appendix. The special bonus on cheese milk is 1d. per gallon.

The above fixed retail prices for fresh milk at present apply only in certain areas, viz., Salisbury, Bulawayo, Gwelo, etc., where a non-statutory milk marketing scheme is at present operating, under which the producer is guaranteed an average price of about 2/7½d. per gallon for milk of a certain standard of quality, premiums being added, or deductions made, according to whether the milk rises above or falls below the standard. Under this scheme, standard quality milk must contain not less than 12 per cent. total solids, and stand up to a methylene blue test of not less than 2 hours in summer, and 3 hours in winter.

For every 0.1 per cent. increase above the standard for total solids, a premium is paid of 0.1d. per gallon with a maximum of 2d. with corresponding deductions for milk which is sub-standard, special additional penalties, however, being imposed in respect of milk falling below 3 per cent. fat or 11 per cent. total solids. In the case of the methylene blue test, ½d. per gallon is added or deducted for each half-hour above or below the standard time, with a maximum of 2d. per gallon. The maximum premium obtainable by a producer is thus 4d. per gallon.

All sampling and testing is undertaken by the Dairy Officers of the Department of Agriculture. The milk is actually purchased direct from the producer by a milk Marketing Committee which then re-sells the milk to the distributors at a lower price, the difference between the price paid to the producer and the selling price to the distributor being, at present, met by Government subsidy.

**Dairy Legislation and Control Measures.** Control of the dairy industry is exercised under the Dairy Act of 1937, which not only makes provision for the regulation of the industrial side of the industry by the establishment of a Dairy Industry Control Board on which producers, factories and consumers are represented, and for the collection of levies and payment of bounties on dairy produce, and the registration of creameries and factories and grading of dairy produce, but also for the regulation of all public health aspects of the industry, such as the registration and inspection of urban and rural dairies and the enforcement of standards of quality, composition, etc., for all dairy products.

**Registration of Factories—Grading of Dairy Produce.** All creameries, cheese factories, condenseries, and dried milk factories have to be registered with the Department of Agriculture, and before registration can be effected, such premises have to comply with certain minimal requirements in regard to construction, accommodation, appliances and equipment. These factories are subject to frequent inspection by the Dairy Officers of the Department of Agriculture. No butter or cheese may be manufactured in a butter or cheese factory unless there is at least one person working in the factory who holds a certificate of proficiency in butter-making and cheese-making. This also applies to the grading and testing of milk and cream, i.e., no person may carry out these duties in a factory or creamery unless he holds a grading or testing certificate. All these certificates of proficiency are issued by the Chief Dairy Officer, who must first satisfy himself that the persons concerned have a sufficient knowledge of the work or duties for which the certificates are required.

All cheddar cheese has to be graded by a Dairy Officer before it can be sold. All cream delivered to a creamery for manufacture into butter has to be graded into one of four grades corresponding with the grades of the butter into which the cream is converted. All packages containing creamery butter must be marked on the outside with words indicating the grade of the contents; all creamery butter is liable, at any time, to inspection and grading by a Dairy Officer, and this also applies to farm butter; packages containing farm butter have to be marked with the words "farm butter" and with the name and address of the producer.

**Farm Butter.** As previously mentioned, no person can make and sell farm butter in the Colony unless he holds a farm butter licence issued to him by the Dairy Industry Control Board. The Board, however, can only issue licences to certain persons, viz., producers who were engaged in, and had built up, a high class business in butter-making before the Dairy Act came into force, or who are so situated that they cannot supply cream to a creamery, or else are dairying in a remote area where the making and sale of farm butter is in the interests of the local community.

All farm butter licences expire on the 31st December in each year, but are renewable; these licences are also subject to such conditions as the Dairy Board may attach thereto, viz., the Board may restrict the sale of farm butter by any person to a particular area, or may limit the quantity which may be sold, etc.

**Registration and Inspection of Urban and Rural Dairies.** All dairy premises throughout the Colony from which milk, cream, butter, cheese or ice-cream is sold or supplied for sale must comply with certain minimal hygienic requirements, and are subject to inspection by a dairy inspector who may be either a Dairy Officer, a Municipal Health Officer or a Government Medical Officer. In addition, all dairy premises from which milk or cream is sold, for consumption as whole milk or cream, in a municipal area or area controlled by a Town Management Board, have to be registered.

Dairies which do not supply milk or cream for consumption as whole milk or cream in a Municipal or Town Management area, i.e., farmers supplying cream or milk to a creamery or factory, do not have to be registered.

In addition to the minimal hygienic requirements which apply to all dairymen throughout the Colony, dairies supplying fresh milk to the Gwelo, Umtali, Salisbury and Bulawayo Municipalities have to comply with certain special requirements in the way of buildings, hygiene and equipment.

As previously stated all dairy producers, including cream suppliers, farm butter-makers, farm cheese-makers or suppliers of milk to cheese factories, have to comply with certain minimal requirements, chief amongst which are the following:—

(1) Milking operations must be carried out in an approved milking place, which includes a properly constructed cowshed, or a simple lean-to shed with a concrete floor.

(2) The milking place must be situated at least 300 feet from any residential quarters, and at least 100 feet away from any other kraal, unless permission to the contrary is given by a Dairy Inspector.

(3) The milking place must be kept clean, and any manure deposited therein must be removed daily.

(4) Milking operations must be carried out in a cleanly manner, i.e., the cows must be clean when milked, and the milkers must wash their hands before milking each cow, and a supply of clean water, receptacles, soap, cloths and towels must be provided for this purposee. If it is necessary to tie the the hind legs of the cow, then proper metal cow hobbles—and not reims—must be used for this purpose.

(5) All untensils, cans, milk buckets, must be of seamless construction.

(6) Facilities must be provided for the proper cleaning and sterilisation by steam or boiling water of all dairy utensils.

(7) A special dairy room must be provided which can be used for the straining, cooling and storage of milk and cream and for the making of dairy produce or for housing dairy utensils. This room may not be used for any other purpose, such as storing meat, vegetables, etc. The dairy must have a cement floor, and be fly-proof, and rat-proof, and well ventilated; it must be so constructed also, that it can be thoroughly cleaned and disinfected when necessary; it must also be provided with a ceiling of some kind.

(8) The dairy must be situated on a site approved by a Dairy Inspector.

(9) All drainage and refuse from dairy premises must be disposed of in a manner approved by the Dairy Inspector.

(10) Except with the special permission of a Dairy Inspector, no person may keep pigs within 300 feet of any dairy building.

(11) Manure or other offensive matter must not be allowed to accumulate within 300 feet of any dairy building or milking place.

In addition to the above requirements, there are various other regulations affecting the sale and disposal of milk from sick or diseased cows, the employment of unhealthy personnel, etc.

## LEGAL STANDARDS FOR DAIRY PRODUCE

The following are the main compositional and quality standards for dairy products:

**Milk.** Milk must contain not less than 3 per cent. of milk-fat and not less than 8.5 per cent. of solids, not fat. It must also be free from the tuberculosis germ, and must satisfy the requirements of the Methylene Blue test. This test is based on the fact that the bacteria in milk possess the ability to decolourise Methylene Blue dye. One millilitre of a standard solution of the dye is added to 10 millilitres of the milk to be tested, which is then kept at a temperature of 98-100 degrees F., until the blue colour disappears. The rapidity with which the milk turns white is considered to be an indication of the number, and the activity, of the bacteria present, and consequently of the conditions and methods of production. The standard laid down, is, that milk must not decolourise Methylene Blue within three hours, in the case of samples during the months of October to the following March; from April to September the standard is four hours.

**Pasteurised Milk.** Must comply with the above standards and, in addition, must comply with the Phosphatase Test.

**Cream.** When sold as cream, must not contain any preservative or colouring matter, or any fat or oil, other than milk fat. It must contain not less than 35 per cent. of milk fat, and be free from the tuberculosis germ. This standard does not apply to cream supplied to a creamery for conversion into butter.

**Reduced Cream.** Must comply with the above standards, but must contain not less than 20 per cent. of milk fat.

**Butter.** Butter must contain not less than 80 per cent. of milk fat, not more than 16 per cent. of water, and not more than 4 per cent. of salt. It must be free from preservative, and contain no mycobacterium tuberculosis.

**Cheese.** Varieties such as cheddar and gouda cheese must contain not less than 45 per cent. of milk fat in its water-free substance; it must not contain any fat or oil other than milk fat.

**Cream Cheese.** Must contain not less than 55 per cent. of milk fat in its water-free substance.

**Skim-Milk Cheese.** Must contain not less than 10 per cent. of milk fat.

**Ice Cream.** Must contain not less than 10 per cent of milk fat, and 18 per cent. of total milk solids, and not more than 0.5 per cent. of stabiliser. It must not contain more than 200,000 organisms per gram.

**Dairymen or others who require more detailed information on any of the matters referred to in this article, are advised to get into touch with the Chief Dairy Officer, Department of Agriculture, Box 25, Causeway, Salisbury.**

# APPENDIX

## DAIRY BONUS SCHEME

Under the following scheme, special bonuses are paid on first and second grade butterfat supplied to a creamery, and on milk converted into Cheddar, Gouda or Roquefort cheese. The conditions are as follows, viz:

The bonuses are as follows:

| | |
|---|---|
| First Grade Butterfat | 4d. per lb. |
| Second Grade Butterfat | 2d. per lb. |
| Milk converted into First Grade Cheddar Cheese | 1d. per gallon |
| Milk converted into Gouda Cheese | 1d. per gallon |
| Milk converted into Roquefort Cheese | 1d. per gallon |

In the case of Gouda and Roquefort cheese which does not require to be graded, the Chief Dairy Officer has to certify that the quality of the cheese manufactured during the year has been such as to merit the bonus.

To qualify for these bonuses, which are payable at the end of each dairying season, viz., at the end of September in each year, a producer must obtain a certificate from the Secretary, Department of Agriculture and Lands, Salisbury, certifying as follows:

(1) That his herd has been milk recorded under the Southern Rhodesia Milk Recording Scheme.

(2) That 25 per cent. of the cows recorded during the year have each produced a minimum of 125 lbs. of butterfat in 300 days or less. This standard operates for the first year. In the second year, this standard is raised to 150 lbs. of butterfat, in the 3rd and 4th years, to 175 lbs., and in the 5th and subsequent years, to 200 lbs. of butterfat.

(3) That his dairy premises are registered under the Dairy Act.

(4) That his methods of feeding and management have been approved—the main factors here, to be the condition of the young stock, and the use of an approved bull.

# Hybrid Maize

## Preliminary Disease Resistance Tests

By I. A. C. FERGUSON
Department of Agriculture, Southern Rhodesia

### Previous Work.

The work of selection and crossing of maize strains to improve yield has been carried out at the Salisbury Experiment Station for the past 18 years. In this time certain double hybrid plants have been evolved and issued to commercial growers, and these hybrid varieties have proved superior in yield over the open pollinated varieties from which they were originally selected.

Work on the disease resistance of these high yielding plants has been confined to the rejection of diseased cobs at harvest, and one test carried out in America in 1947 for susceptibility to Leaf Blight. In this test five varieties, namely 7H36, 7H101, 7H139, 7H160 and 7H220, were artificially infected with Leaf Blight (*Helminthosporium turcicum*) from laboratory cultures. Each variety was tested in a six-hill plot with three replications giving 18 plants of each variety. Planting was carried out on 21st May. From June 17th, eight inoculations were made at three-day intervals by spraying a 1/10 dilution of the laboratory culture on to the leaf whorl of the plants. The first signs of disease appeared on June 30th and by July 15th secondary spread was recorded. Readings of the severity of infection on the five varieties were taken in August and again in September, using the scale 0.5 to 5.0 for increasing severity of infection. A desirable rating for a resistant variety is 2.0 or less. Results for the Rhodesian hybrids tested were:—

| Hybrid | Parentage | August Rating | September Rating |
|---|---|---|---|
| 7H36 | (K4222 x N328) | 2.3 | 3.0 |
| 7H101 | (N3145 x A25) | 3.0 | 3.3 |
| 7H139 | (N3233 x M99) | 2.0 | 2.7 |
| 7H160 | (N4426 x H236) | 2.3 | 3.0 |
| 7H220 | (N3226 x W3) | 1.3 | 1.7 |

These results show that the Rhodesian selections compare well with the varieties developed elsewhere in respect of their resistance to Leaf Blight disease. In particular the Hybrid 7H220 comes in the top quarter of all the plants tested for Leaf Blight resistance at the United States Department of Agriculture Experiment Station at Beltsville in 1947. Several of the above strains tested at Beltsville have since been discarded, namely N328, N4426, N3226 and W3, and H236. The others are in use to-day in the double hybrids at present being grown in Salisbury.

## Varieties Selected for Testing.

The plants selected for testing in the present experiment were chosen by the agronomist in charge of the Salisbury Experiment Station as the most promising of the double hybrid plants together with their parent strains. A sample of local open pollinated maize was included for comparison, e.g.:—

Double Hybrids: 49DH21, 49DH29, 49DH18.

Inbreds: N3149, N3134, K4222, A576, M995, T4721, N2656.

Open Pollinated: McKerrel's Hickory King.

## Diseases Selected.

The division of Plant Pathology were consulted and the following diseases common on maize in the Colony were selected.

| | |
|---|---|
| Cob Rots | *Fusarium spp. Diplodia zeae.* |
| Leaf Blight | *Helminthosporium turcicum* |

## Laboratory Technique.

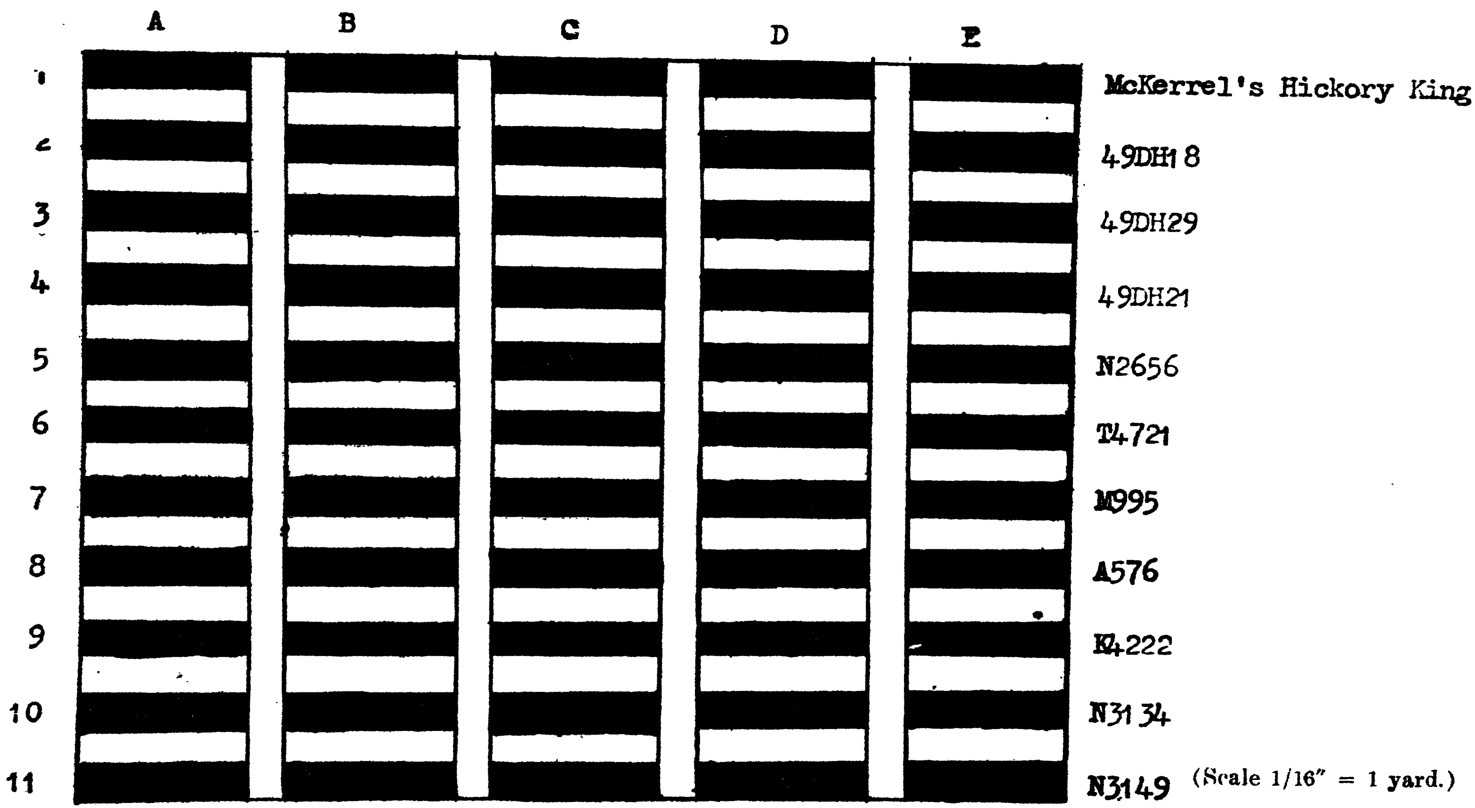
Cultures of *Fusarium moniliforme* were isolated from maize seedlings grown in a rag doll test. A pure culture of *Diplodia zeae* was obtained from Potchefstroom by courtesy of Dr. Gorter. *Helminthosporium turcicum* was isolated from a lesion on a maize plant growing on Plot 5 of the Salisbury Experiment Station.

These pathogens were bulked up on corn meal agar on petri dishes. Pure cultures of each were established and carried on in prune agar slopes.

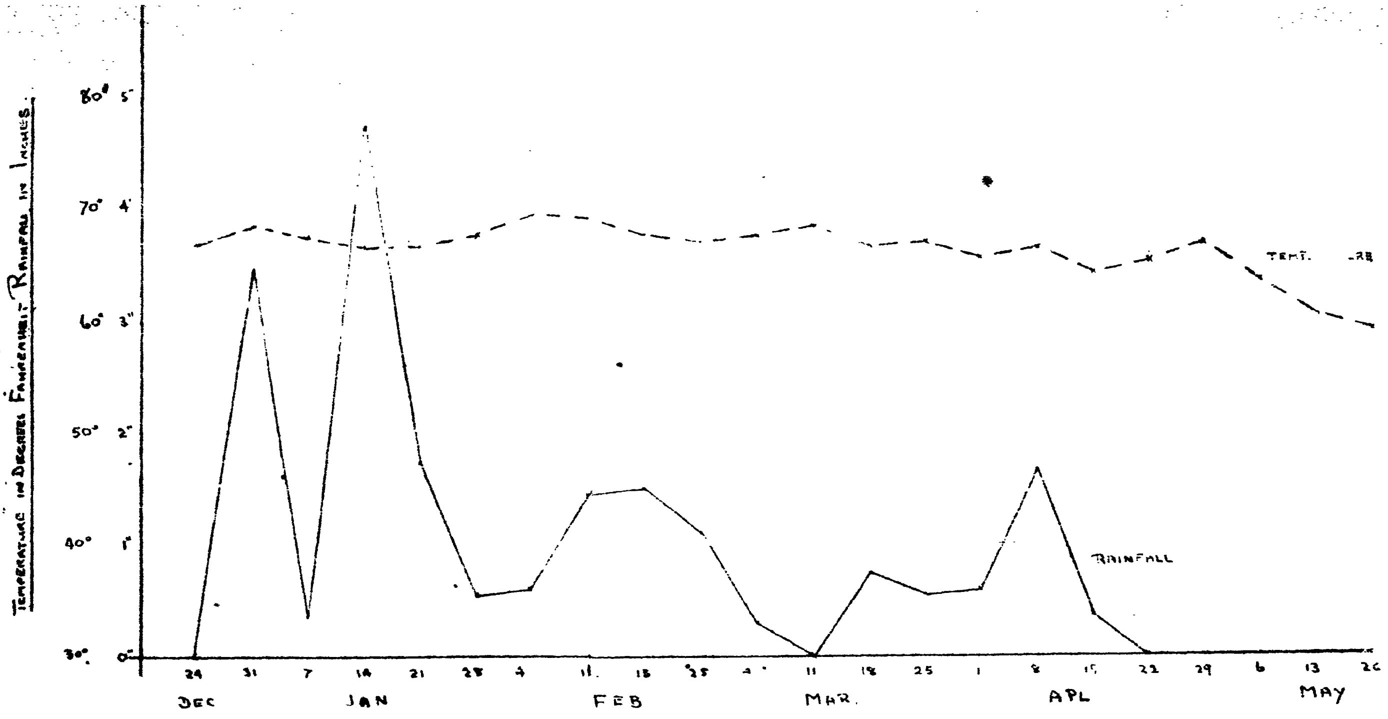
Various inoculation methods were now tried on a plot of single hybrid corn.

(a) A spore suspension was made in sterile water direct from the petri dish and inoculated to the cobs by a hypodermic needle at 3cc/cob.

(b) A culture on corn meal agar blocks floated on sterile water in test tubes was used to simplify the hypodermic inoculation method, and the suspension was injected to the cobs at 3cc/cob.



(Scale 1/16″ = 1 yard.)


TEMPERATURE IN DEGREES FAHRENHEIT RAINFALL IN INCHES.
80° 5"
70° 4"
60° 3"
50° 2"
40° 1"
30° 0"
24
31
7
14
21
28
4
11
18
25
4
11
18
25
1
8
15
22
29
6
13
20
DEC
JAN
FEB
MAR.
APL
MAY
TEMP.
-38
RAINFALL

(c) Spore suspension of each of the three pathogens were sprayed on the silks one week after emergence.

(d) A disc of the agar culture was punched out by a cork borer and appressed to the maturing grain at the milk stage, by punching out a disc from the cob sheath. The disc of sheath tissue was replaced and held in place by cellophane tape. A cellophane bag placed over the cob retained the humidity and favoured the fungus in the initial stages.

Twenty plants were inoculated by each of these methods and harvested at two weeks, then at three, four, five and six weeks after inoculation to determine the rate of spread as well as the most suitable technique for each disease. The most satisfactory results with *Diplodia spp.* and *Fusarium spp.* were obtained by the agar disc method (d); allowing a three week incubation period. For *Helminthosporium spp.* a suspension of spores sprayed on to the leaf whorl of plants just before cobbing, gave the most uniform infection rate.

## Field Technique.

1. **Lay-out of Test**: The Salisbury station had already been laid out for the season when the present tests were started in December, 1949. Consequently it was not possible to replicate the test on widely separated plots and a design was adopted to suit the available ground as follows:—

Eleven plots each of 20 plants spaced at 3 feet x 3 feet were replicated five times, giving five plots for each maize variety under test. Each plot separated from its neighbour by a 6 foot path.

2. **Manuring**: The plot used had been fallow the previous season. The first dressing was given on January 15th when the plants were at knee height, this was a side dressing of 50 lbs. N. and 50 lbs. P. per acre. An additional dressing of 50 N. was given on February 23rd.

3. **Field Data**: (a) The trial was planted two plants to a hill on December 19th, 1949, with the varieties laid out as shown in the diagram. The plants were singled on January 5th.

(b) Row D: Lots 1 to 11 were inoculated with *Fusarium monoliliforme* on April 14th.

Row C: Lots 1 to 11 were inoculated with *Diplodia zeae* on April 18th.

Row A: Lots 1 to 11 were inoculated with *Helminthosporium turcicum* on April 15th, 17th and 19th.

Row B: Lots 1 to 11 were inoculated with *Fusarium moniliforme* using the hypodermic injection method.

**Row E: Lots 1 to 11 were given a N. dressing equivalent to 1,000 lbs. N/acre on February 23rd as a check on the effects of an excessive application of Nitrogen on the test plots.**

(c) On each plot the top row of ten plants was inoculated, and the bottom row kept as control. The poor condition of the soil gave an uneven growth between plots, and the late planting favoured stalk borer attack. Despite these factors, the growth was adequate for the assessment of disease spread.

(d) Plots were harvested as follows:—

Row D: Lots 1 to 11, May 8th.
Row C: Lots 1 to 11, May 12th.
Row A: Lots 1 to 11, May 15th.
Row B: Lots 1 to 11, May 17th.

## Results.

In assessing results a scale was used as follows:—

A rating of 0 indicates no spread from the site of inoculation. 1, 2, 3 and 4 indicate increasing severity of infection, and 5 indicates severe damage spreading from the site of inoculation.

| | Parentage | *Fusarium* | *Diplodia* | *Helminthosporium* |
|---|---|---|---|---|
| 49DH21 | (N3149 x A576 x T4721 x M995) | 2.2 | 2.0 | 1.5 |
| 49DH29 | (N3149 x M995 x K4222 x N2656) | 2.5 | 2.5 | 1.5 |
| 49DH18 | (N3149 x A576 x K4222 x N2656) | 2.0 | 2.0 | 2.0 |
| Hickory King | | 3.16 | 2.5 | 3.0 |
| N2656 | | 3.1 | 2.5 | 3.0 |
| T4721 | | 1.4 | 1.5 | 2.5 |
| N3134 | | 2.4 | 2.0 | 3.0 |
| N3149 | | 2.6 | 2.0 | 2.5 |
| A576 | | 2.0 | 2.0 | 3.0 |
| K4222 | | 2.6 | 2.5 | 2.5 |
| M995 | | 2.3 | 2.0 | 3.5 |

These results are to be interpreted in the light of the climatic conditions prevailing this season, a chart of rainfall and temperature over the experimental period is attached.

A correlation has been found between these figures and the natural incidence of cob rots on these strains growing on other plots on the station.

## Conclusions.

The present series of experiments allow the maize strains concerned to be placed in order of resistance to the diseases tested. From the plant breeder's point of view the results should be considered together with the general disease survey of inbreds and hybrids on the Salisbury station and with the climate charts. A more fertile and uniform test plot would improve the efficiency of future tests, and certain refinements of laboratory technique are also contemplated.

## Summary.

Three double hybrids, seven inbreds and one open pollinated variety of maize were tested for resistance to diseases common in the Colony. Previous work carried out in the United States on Rhodesian maize is recorded. The techniques evolved for the present tests are detailed. Results are given together with a temperature and rainfall chart for the test period.

# Native Labour in Agriculture

[This report, by Mr. V. M. Wadsworth, deals with the results of the first part of a survey of labour use and mechanisation in agriculture. As the enquiry proceeds, further reports will be published. The decision to publish the results as they become available is based on two factors. First, the labour problem will continue to press more and more heavily against expansion in agriculture and industry so long as no general effort is made to face up to it. Second, solution of the problem lies in the hands of employers rather than in the hands of the Government. It consists in more efficient use of more efficient labour, and this enquiry, after setting out the problem in its true perspective, will be concerned with the means by which these ends can best be attained. Improved conditions for farmers are likely to depend as much on the reduction of mounting costs as on pressure for higher prices, and whilst native wages will inevitably rise, the real cost of labour is capable of substantial reduction if better pay or better living conditions for native workers go hand in hand with harder work and better labour management. The field work on which the enquiry is based has been carried out so far by Mr. R. Anderson, Mr. A. N. Perioli, and Mr. J. D. Hopley, of the Economics Branch.]

## 1. INTRODUCTION

The last few years have seen a spate of recommendations for enquiries into the position of native labour in Southern Rhodesia, not with regard to agriculture alone, but in respect of industry and domestic service also. These in their turn have arisen from the concern of farmers, industrialists and others that the great expansion of the post-war period must necessarily be slowed down as the shortage of labour becomes more acute. Farmers have complained that domestic service and industry are cutting into their labour supply; whilst industrialists are apt to suggest that the position in agriculture is not one of shortage, but of inefficient use.

This Colony has reached a stage where its development is handicapped by inadequate labour reserves. Not that this is the first time that it has done so. The difference between the present shortage and past shortages is that there is now no prospect of appreciably increasing the number of workers which enter the Colony. As a result of development in other countries in Eastern and Central Africa, Southern Rhodesia can no longer look north for an abundant supply of labour to make good its own deficiences.

At present approximately 54 per cent. of the Colony's labour comes from neighbouring territories, but in spite of the activities of Ulere and the Rhodesian Native Supply Commission, the flow is diminishing year by year. The enormous jump in 1949 was due to a variety of circumstances, not the least of which was the recurrent effect of severe drought conditions in the north and east, and should not be regarded as other than temporary.

**Immigration of Native Labourers to Southern Rhodesia**

| Year | Nyasaland | N. Rhodesia | Portuguese E. Africa and Territory | Others | Total |
|---|---|---|---|---|---|
| 1940 | 18,777 | 14,000 | 29,814 | 3.521 | 66,115 |
| 1941 | 27,054 | 14,861 | 31,940 | 4,124 | 77,979 |
| 1942 | 17,734 | 12,435 | 31,257 | 3.330 | 64,756 |
| 1943 | 21,659 | 12,923 | 33,308 | 4,511 | 72,401 |
| 1944 | 27,884 | 12,360 | 40,996 | 5,487 | 86,727 |
| 1945 | 24,999 | 10,731 | 36,133 | 5,249 | 77,112 |
| 1946 | 22,160 | 11,990 | 34,281 | 6,481 | 74,912 |
| 1947 | 21,828 | 10,921 | 33.558 | 5,346 | 71,653 |
| 1948 | 17,392 | 11,008 | 33,267 | 4,739 | 66,406 |
| 1949 | 19,477 | 10,798 | 52,398 | 6.273 | 88,946 |

The Annual Report of the Nyasaland Protectorate Labour Department notes the increased opportunity for employment in that country, and the high prices that are being paid for local primary produce. More urgently it seeks to dispel the general impression amongst Nyasaland's neighbours that she constitutes an inexhaustible "widow's cruse" of labour, and urges that in the future she will have to retain more and more of her own labour within her own borders. The position in Portuguese East Africa is essentially similar in its fundamentals. Thus Southern Rhodesia must learn to make better use of its diminishing labour resources.

Early in 1949 a Select Committee was appointed to investigate the reasons for the labour shortage and its supposed maldistribution, and to make recommendations that would ensure a better distribution of the available supply. In its report it stated its opinion that there was no real shortage of labour in so far as actual numbers were concerned, but that the apparent shortage was due primarily to inefficient use. It was greatly handicapped by the lack of complete information regarding the utilisation of labour and recommended detailed enquiry into major branches of industry.

In its "Five Year Plan for Agricultural Production in Southern Rhodesia" the Divisional Committee of the Department of Agriculture stated:—

> "We consider this matter of such vital importance that we recommend a detailed investigation by a competent Committee of the whole question of the better distribution, and more efficient use of available supplies of labour in the Colony."

So too, Professor Sir Frank Engledow, realising the necessity of labour data for future planning, both on the farm and the national scale, recommended as follows in his Report on the Agricultural Development of Southern Rhodesia:—

> "It is clear that no comprehensive, planned, treatment of the labour problem will be possible until much more primary data is available. Support is therefore given to the Five Year Plan Committee's proposal for a general enquiry on labour, with an immediate sample survey of agricultural use of labour."

The weakness of the present position was emphasised in October, 1949, when a proclamation by the Nyasaland Government stopped all recruiting in the Central and Southern Provinces of that Protectorate—ostensibly because the labour would be required for the 1950 crops in Nyasaland itself. Although this proclamation was soon withdrawn, its effect and warning were profoundly disturbing.

In the face of these developments this Branch began an enquiry into the position of Native labour and of mechanisation on European farms. Farms were divided into five major farming types—Maize, Tobacco, Dairying, Ranching and Mixed Farming, a farm being classed as a maize farm if not less than 50% of its total income came from the sale of maize, and similarly with the other farming types. The survey was to be a sample one only, and the objective 80 farms in each group. Maize and Tobacco were to be completed during 1950, and the other types during the following year. The objects of the survey were to obtain a clear picture of the numbers of natives employed on different types of European farms, paying attention also to skill, sex, country of origin, and where possible to previous type of employment. It was to investigate the conditions of their employment in respect of cash wages, systems of payment, hours of work, housing, rations, other amenities, and so on. Information was to be sought also with regard to the stability of farm labour. In view however of the oft-repeated statement that there was more inefficiency than scarcity, the main purpose of the survey was to examine the nature of the work given to natives, and the effectiveness of their utilisation, both with regard to efficiency of use and the efficiency of labour itself. Finally, the survey was to determine as far as possible the present position with regard to farm mechanisation on the same group of farms.

## 2. SOME PRELIMINARY CONSIDERATIONS.

Although it has been clearly recognised for some time that the efficiency of our native labour employed in Agriculture is low (maize production in the Union of South Africa requires an average of 4.3 boy days to the acre as against an apparent requirement in this Colony of 12.3 boy days) no satisfactory evidence has so far been produced to substantiate statements that it is on the decline.

The position was examined by the Central African Statistical Office in a published article incorporated in the Annual Report of the Agricultural and Pastoral Production of European Farmers for 1947/48. From this examination the conclusion was drawn that productivity per worker showed no apparent decline during the previous decade. The method employed in this examination, however, was unable to take into account changes in the character of agricultural output (as, for instance, the rapid growth of tobacco production), or the effect of increasing mechanisation, or the fact that, in general, the individual farmer's labour requirements per unit of output should tend to be reduced as his enterprise is expanded. The major weakness in that method, changing character of output, may be overcome by assigning unitary labour requirements to separate categories of crops and livestock. On such a basis the total work requirement of the sum of the crops and livestock of each year may be computed and a reasonable approximation of work output per worker can be arrived at.

Unitary labour requirements are assigned to the different categories of crops and livestock in the following table. These requirements, based on the best data available, are rough approximations only, but it will be recognised that for the purpose for which they are used here such rough approximation is adequate.

| Crop or Stock | Unit | Unitary Labour Requirement |
|---|---|---|
| Tobacco | per acre | 10.0 |
| Grain | ,, | 1.3 |
| Groundnuts | ,, | 5.0 |
| Potatoes | ,, | 5.0 |
| Cotton | ,, | 3.0 |
| Other Crops | ,, | 1.0 |
| Dairy Cows | per head | 1.5 |
| Other Cattle | ,, | 0.3 |
| Pigs | ,, | 0.5 |
| Sheep and Goats | ,, | 0.2 |

Using the foregoing schedule, the annual agricultural labour requirement has been calculated from the statistical returns and this figure, divided by the labour force of that year, gives a fair indication of work output per Native employed.

| Crop Year | Unitary Labour Requirement | Native Workers Employed | Output per Worker (Production Units) |
|---|---|---|---|
| 1938/39 | 1,727,913 | 92,051 | 18.7 |
| 1939/40 | 1,760,168 | 93,636 | 18.7 |
| 1940/41 | 1,838,440 | 96,195 | 19.1 |
| 1941/42 | 1,701,098 | 101,000 | 16.7 |
| 1942/43 | 1,736,043 | 110,492 | 15.7 |
| 1943/44 | 1,716,901 | 114,305 | 15.0 |
| 1944/45 | 1,845,122 | 123,619 | 14.9 |
| 1945/46 | 1,928,285 | 130,636 | 14.7 |
| 1946/47 | 2,175,912 | 135,822 | 16.0 |
| 1947/48 | 2,356,816 | 147,412 | 15.9 |
| *1948/49 | 2,472,935 | 147,262 | 16.7 |

*** Provisional only.**

The two major factors not taken into account in this table are seasonal effect on labour requirement and the growth of mechanisation. Making allowance for seasonal influence, it would appear that there has been a significant decline in labour efficiency since 1940. Increasing mechanisation in the later years (apparent after 1945/46) has masked the trend, which indicated a fall of roughly 20 per cent. in output per worker from about 1940 to 1945.

Although this examination appears to confirm the widespread opinion that output per worker has declined over the last decade, it provides no conclusive proof that the decline has been wholly due to increasing indolence on the part of Native labour. With the expansion of individual farm enterprise, with more diversification on individual farms, with the entry into a more prosperous industry of farmers new to the job of handling Native labour and perhaps, also, with old-established farmers tending to relax under improved financial circumstances, the decline in output per worker is probably also in part due to lack of efficiency in labour use.

Farmers questioned in the course of this enquiry were about equally divided on the issue as to whether the general efficiency of their workers had increased or decreased in recent years. Where Natives have stayed in farm employment over a number of years they have gained in skill, but this advantage has been offset by their working less hard. Food shortages in neighbouring territories have at times resulted in immigrant labour of low physical standard despite improvement in conditions due to Government recruits and the operation of the Ulere system. Partly as a result of the competitive demand for labour, farmers are not in a position to apply such disciplinary measures as were formerly effective. Machinery is probably regarded by the Native not as a means of stepping up output but as something to lighten his task, and increased mechanisation over recent years has not resulted in the labour saving that might have been reasonably anticipated. The general conclusion remains, therefore, that output per worker has declined and is declining through lower effort on the part of the worker and lower efficiency in labour utilisation. It has to be recognised that both standards are low and that unless appreciable improvement can be effected this constitutes the gravest threat to meet the growing needs of the Colony. The key factor is efficiency in labour use. Better efficiency in labour use will go hand in hand with better application by the Native worker.

## 3. FARM LABOUR ON TOBACCO FARMS.

### General.

All the farmers co-operating in this group obtained not less than 70 per cent. of their total income from the sale of tobacco.

Five of them grew tobacco only and nine others only tobacco and maize, but the majority grew a better balance of crops. The average summer cropping on the 80 farms studied was:—

| | |
|---|---|
| Tobacco (Flue) | 104 acres |
| Maize | 80 ,, |
| Green Manure | 56 ,, |
| Legume Hay | 10 ,, |
| Other Crops | 18 ,, |
| Total Summer Arable | 268 acres |

out of a total average acreage of 4,601 acres per farm.

Included in the other crops are 40 acres of Virginia fire-cured tobacco (one grower), 100 acres of Turkish tobacco (12 growers), 20 acres of potatoes (5 growers), 190 acres of groundnuts (20 growers), and 110 acres of silage (3 growers).

It can thus be stated that on what we know as tobacco farms, the typical cropping during the 1948/49 season was one consisting of tobacco for sale, maize principally produced for Native rations, and green manure for the maintenance of fertility. In addition an average of 38 acres of veld hay was cut and 40 tons of compost was made per farm. Only five of these farms had any winter arable, a total of 70 acres.

Of the farms studied 56 had between 40 and 100 acres of tobacco, 17 had between 100 and 150 acres, 4 between 150 and 200 acres, one had 320 acres, another 670 acres, and a third 1,000 acres.

There was an average of 10 barns per farm, operating on wood fuel, 14 farms having also a total of 112 coal-operated barns between them. (An average of 10 acres of the crop per barn per season is generally accepted as about right in the tobacco-growing industry.)

Stock on these farms consisted principally of ranch stock and work oxen, with a thin sprinkling of other types. The average was as follows:—

Ranch Stock:

| | |
|---|---|
| Cows | 65 |
| Followers | 64 |
| Others | 61 |
| Other Cattle | 7 |
| Work Oxen | 34 |
| Equines | 2 |
| Sheep | 21 |
| Goats | 5 |
| Pigs | 5 |
| Fowls | 26 |

In terms of cow units this is equivalent to 106 units per farm. "Other Cattle" shown in the above table are dairy stock kept by 10 of the farmers in the sample.

### Labour Requirement.

To maintain the stock shown above farmers kept an average of five boys—i.e., one boy for every 21 stock units. An average of 73 boys were employed on crops. This works out at 3.6 acres per boy as against 4.6 on the national average. (Note the total average of 78 boys is in terms of adult boy units. There were in fact 74 adult boys and 12 picannins per farm.)

This figure consists of regular or permanent labour only. There was in addition an average of 20 casuals per farm (male adult equivalents), or one casual labourer to every 13 acres of crop. In actual fact, all or most of this labour would be employed on the tobacco crop.

### The Source of Regular Labour.

It is extremely disturbing from the national standpoint that, of the labour employed on these tobacco farms, only 31 per cent. is indigenous to Southern Rhodesia, 69 per cent. coming from across our Northern and Eastern borders. In five cases there was an absolute dependence on alien labour.

Native labour is notoriously unstable. The African is migratory in his habits, not only in so far as he leaves the country of his origin to work in another land, but also in that within his own country he spends first a spell in employment and then returns to his reserve. He may return after his rest to employment in quite a different branch of the economy from that of his previous employment. Thus he will go from the town where he has been a house-boy to his reserve, and from thence to a farm. After a further spell of reserve life he will work in a mine and from there perhaps to light industry. It is this inconsistency of habit and migrancy from place to place and job to job which is held largely responsible for the low level of efficiency of the African in employment. It should be noted in this connection that the example given above is an extreme. Few Natives move about to this extent, and particularly amongst the alien Natives movement is from billet to billet within one occupation rather than from industry to agriculture or some other work.

On the farms studied 17 per cent. of the total labour supply had been on the same farm for more than three years. A further 30 per cent. was in its second or third season, and the remaining 53 per cent. was in its first season only. It has been seriously advanced by social thinkers and others that migrancy would be reduced if the worker were allowed to have his wife and family with him at the place of his employment. In this connection, it is interesting to note that on these farms there was a marked correlation between length of stay and the presence of family. Some 18 per cent. of the total adult males had their families with them, and all these had been on the farm for two or more seasons. It is noteworthy that the farms with the oldest established labour force were also the farms carrying the highest percentage of men with resident families. There is, of course, more wisdom in this than the mere desire to stabilise the regular labour supply. The compound with its women and picannins, apart from preserving normal marital relations and happiness, also ensures a useful supply of casual labour, available on call.

## Kind of Work Performed.

**Men.**—Though there is a low degree of differentiation of labour, farmers use some of their Native labourers for one job only. Thus on some farms we have found boys described as ox-driver, milker, pig-boy, builder. But in 90 per cent. of cases they have been described as general. Such boys are expected to be able to do any job on the farm, milking, ploughing, seed-bed work, watering, land clearing, picking, grading and so on. What differentiation there is has come from experience and not from training. A farmer will refer to a worker as a good ploughman or milker or tractor driver or grader. But he is rarely specially trained or hired as such, and merely shows some special aptitude. Where, however, this does exist, we have found substantial evidence of differential payment.

Not infrequently one of the labourers has acquired a handyman skill based on a natural aptitude in the use of tools and, classed as a builder, he will do such jobs as rough carpentry and masonry, repairing shoes, mending motor car tyres, slaughtering animals. Such men, and those employed as storeboys, earn substantially higher wages than the rest, often four or five times as much. Tractor drivers, milkers, pig-boys, and the like also usually receive differential rates, but nothing like as high as the categories mentioned above.

Most operations in farming require a standard of skill that is not difficult to acquire; after this it is experience that counts. The actual knowledge of crops and their handling, soils, times of ploughing and reaping, is held either by the farmer himself or by his manager, and the Native labourer is neither required nor encouraged to do any more than obey instructions. In this was he has little opportunity of acquiring that knowledge of farming which would make him a more valuable labourer.

**Women.**—While all the men on the farm are in constant employ of the owner (unless special leave of absence is given), the women are rarely in regular employment. In a very few cases one or two have been employed as domestic servants, but in most instances men are preferred. The women are called out from time to time as casual labour and are paid mostly by the day. Ten of the farmers made no use of casual labour. Of the remainder 65 drew all or most of their supply from the compounds, whilst five others were wholly dependent on neighbouring reserves. Women are engaged in planting and reaping mealies, in weeding, suckering, picking, tying and untying tobacco, and so on. Whilst the recorded rate of absenteeism amongst men was rarely more than five per cent., and never more than 10 per cent., that amongst women was relatively high, and we have received repeated evidence that they will down tools on relatively slight provocation.

**Picannins.**—Children of about eight and upwards are employed on both a casual and a permanent basis, as herds, for leading the oxen at the plough, and for lighter seasonal labour.

## Hours and Days of Work.

It would appear that the supposedly universal hours of labour, "from sunrise to sunset," with breaks for meals and periods of rest, do not apply on tobacco farms. Sixteen of the farmers stated that their labourers worked from four to six hours per day, whilst a further 46 regarded six to eight hours as normal. The remaining 18 (all with a heavy stock population) worked their staffs from eight to ten hours daily. With breaks for meals, rests and so on, all these figures can be reduced by at least one hour to arrive at actual working time. These hours are worked six days a week for from nine to ten months in the year, the bulk of the labour force often being paid off, or dismissed during two to three months of the dry season. (There is an increased tendency to retain labour, even in idleness, for the whole 12 months.) On most of the farms visited, it was found to be normal practice for the Natives to start work at, or even before, sunrise and to finish by the middle of the day.

Until more farmers keep proper labour records, any attempt to calculate the actual average number of days worked and the hours worked is out of the question, but the statements on which the foregoing comment has been based are sufficient to be more than a rough guide. It is certain that on tobacco farms neither the number of days nor the number of hours per day are as great as in industry, though in the latter both days and hours, as well as the volume of the task, are more regular and more clearly defined.

**Wages.**—Wages are invariably paid in cash and in kind. There is no such thing as a standard wage, and it is very difficult to say how far the figures quoted here are of general applicability, even for tobacco farms. It would perhaps be fairest to say that the wage conditions, rather than the actual wages here depicted, represent a fair normal, and that there are many variations from that normal.

**Cash.**—The average cash wage paid to boss boys was £3 2s. 6d. per month, with a range running from £2 10s. 0d. to as much as £5. As stated earlier, conditions for builder-boys and store-boys were much better. The highest wage paid in these special classes was £8 and the lowest £3 10s. 0d., with an average of £5. Tractor boys were paid an average cash wage of £3 with rates varying between £3 10s. 0d. and £2 5s. 0d. For general labourers the rates fluctuated, even on the same farm, between £1 5s. 0d. and £2 5s. 0d., with an average cash wage of £1 15s. 0d. (Wage rates fluctuate on individual farms principally on an incremental basis.) Picannins were paid anything between 2s. 6d. and £1, with an average rate running at 14s. Of the farmers employing casual labour, 50 per cent. paid at the rate of 1s. per day cash for women and from 1s. 6d. to 2s. per day cash for men. The remainder paid rates varying from £1 to £2 5s. 0d. per ticket of 30 days.

### Wages in Kind.

**Food.**—For men, the usual ration, almost without exception, has been from 14 to 17 lbs. of mealie meal, 2 lbs. of meat, and 2 lbs. of beans or groundnuts per week, with salt always and vegetables in season. Occasional farmers have issued fish in place of meat, and 20 per cent. of the cases studied made also an allowance of sugar. 32 per cent. of these farmers issued one-third of a ration to non-working wives of boys employed.

The treatment of casual workers varies somewhat. 54 per cent. gave full rations, 30 per cent. gave half rations, and the rest (mainly farmers paying high ticket rates) allowed no rations.

On many farms a weekly ration of tobacco is given and on some a weekly ration of soap.

### Other Wages in Kind.

It was customary on 65 per cent. of the farms to give Christmas gifts to the entire labour force, consisting of such things as clothes, sweets for children, beer, cooking pots, and so on. Three farmers allowed their married boys cropping and grazing rights, and 67 others allowed each compound a garden or plot for the growing of mealies, etc., consisting of anything from three to ten acres. Thirty-two farmers provided their boys with protective clothing.

There are two good reasons for attempting to place a cash value on wages in kind. In the first place, some standard of comparison with industrial wages is desirable. In the second place, it is necessary to know what a farmer's labour is costing him. It is essential to distinguish clearly between wages and cost of labour. The wage is what the labourer receives and must be considered in terms of the value to him. It is very easy to confuse these two issues. Thus, in calculating the value of a plot of land, the product of the land ploughed can be taken to represent what the labourer earns under that head. But it should not then be assumed that the employer has paid this amount to the worker. In reality, the cost to the employer is something considerably less.

The cost of the average ration to the tobacco farmer is, per working year:—

| | | | |
|---|---|---|---|
| Mealie Meal | £7 | 0 | 0 |
| Meat | 3 | 0 | 0 |
| Beans | 0 | 15 | 0 |
| Other | 0 | 10 | 0 |
| | £11 | 5 | 0 |

To this should be added 10s., which is the average cost of protective clothing, and an average of £1 per boy for gifts. The cost of land to the farmer is negligible, and so is that of housing since, in the main, the materials used have no market value and the labour is normally supplied by the worker himself.

The cost then per labourer to the farmer of wages in kind is probably not more than £13 per year on tobacco farms. The value to the labourer is more likely to be £19 per annum.

### Other Inducements to Labour.

It is evident that the practice of advancing cash to employees is widespread and that, in fact, many of the Natives are in debt to their employers. It is difficult to gauge the extent of this indebtedness. Some farmers advance money in order to bind the worker, who is unable to leave the farm until he can pay his debt or, in some cases, can persuade a new employer to take it over. Few farmers have been willing to state the degree of advances, but we have found cases of up to £20. It is common practice on these farms to buy a boy a bicycle, the cost of which he pays off in small instalments. We have encountered no cases of free gifts of this magnitude. The provision of leave on full pay is general.

Forty-six of the farmers visited provided their labourers with a farm store, and 20 of them employed a Native schoolteacher. All farmers regarded the provision of rough medicinal and first aid facilities as part of their duty. One such farmer had a private clinic, school hall and recreation hall for a staff of 100 boys. Three farmers had laid aside a football ground and organised teams.

### Housing.

The housing provided on these farms was of poor quality. Of the 80 compounds the houses in four were of brick under thatch, the rest of pole and dagga built by the labourers themselves. Two compounds were described by the investigators as frankly poor, 14 as being in good condition, and the rest as fair. A hut in fair condition is the usual type of hut of about 10 feet diameter, improperly ventilated, windowless, and often pervious to bad weather. No inside inspections were carried out.

### Method of Payment and Deductions.

The general method of payment for regular labour on the farms visited was on the ticket of 30 days. It is customary to set aside one day weekly for the cashing of completed tickets. All except 12 farmers combined a system of piece work with the ticket system for their general labour.

Only 17 farmers were operating the deferred pay system for boys from Nyasaland.

In 58 cases bonuses were paid in addition to wages. There were monthly bonuses in a few instances. Boys who missed no days during the month were sometimes given an amount varying from 1s. to 2s. 6d. in addition to the wage. In the majority of cases, however, boys regarded as satisfactory were given 10s. at the end of the season.

Some farmers deduct a proportion of the cash wage from workers who are absent without leave, particularly if the cause be drunkenness. The practice is not universal and depends on the individuals concerned, both employer and labourer.

### Labour Shortage.

(a) **Seasonal Labour.**—25 per cent. of farmers complained of a shortage of seasonal labour.

(b) **Permanent Labour.**—Only 20 per cent. complained of a shortage of labour for the existing development of the farm, but 46 per cent. said they were short for further development. 54 per cent. described their supply as "satisfactory." This aspect will be more fully covered in a later section.

### Recruiting.

Farm work, taking it by and large, is not popular. Work on tobacco farms is probably more popular than work on any other types however, and only 16 farmers had any recruited labour. None of these had any great number.

As long as Natives do not want to work on farms, recruiting, whether by Government or by private agency, will not effect much except to increase the overhead expenses of farming without benefiting the labourer or the farmer. All attempts to reduce labour shortage, where this does genuinely exist, that do not take into account the fundamental economic fact that wages and conditions on farms are not sufficient to attract labour, are doomed to failure.

## SECTION 4.

### The Efficiency of Labour Use.

The efficiency of the use of labour is not only a matter of great national interest, but it is also one of increasing importance to the individual farmer. Labour is costing more, year by year, and the demand for it from the towns is drawing increasing numbers away from the country.

The most obvious method by which labour costs on individual farms can be compared with those of other farms is by calculating the cost of labour per acre or the number of men employed per 100 acres. Although both methods are suggestive, they have obvious limitations under our conditions. The amount of labour depends on the degree of development of the farm, on the density of stocking with livestock, and on the proportions of the different crops with their variable labour requirements which go to make up the arable land. Thus a high expenditure per acre on labour is justified provided a high output per acre is produced.

A second method, used commonly overseas, is to measure the output per man or, more simply, the gross output per £100 labour costs. On farms which are reasonably alike, and in countries where farmers have been sufficiently long used to agricultural economists to divulge financial information freely, this method provides a valuable guide in tracing faults in management. But as a measure of labour efficiency it has marked limitations, and it was decided that it could not be used for the purpose of this survey. Gross output per £100 labour is a complex factor, and depends not only on the amount of work performed by the men, but also on the choice of enterprise. Tobacco, for instance, gives a much greater return than maize. This does not invalidate the use of this factor when comparing mixed farms of similar type, but it does show that each man-hour may produce widely different financial returns when employed in different enterprises.

To measure the efficiency of labour use under our conditions, it is therefore necessary to measure not the monetary return, but the physical labour required to grow crops or to tend livestock. The most suitable measuring stick of physical labour is that of work units. The reasoning behind this concept is as follows. A work unit represents the work performed by one Native in one day under average conditions. Thus, if an acre of maize requires 104 boy hours to grow and harvest, this is equivalent (assuming eight hours per day working in the field) to 13 boy-days or 13 work units per acre. Similarly, if a dairy cow requires on the average 160 boy-hours of work per year, then one dairy cow requires on the average 20 work units per year. A list of work units per acre and per head of livestock can thus be computed from crop and livestock enterprise costs. From it estimates can be prepared of the quantum of work necessary for any particular farm, assuming average conditions.

The standard is an arbitrary one, but the figures which have been used to compile it were based on the best information available. They were worked out from a combination of data including the practical advice of experienced Government officers, the comments of farmers included in the survey, cost data collected by this department within the Colony, and similar material relating to conditions in the Union of South Africa.

The standards given below in respect of crops are on the assumption that the farmer is using ox labour only.

| | | |
|---|---|---|
| For | Maize or Grain …… …… | 13 units per acre. |
| | Maize for Silage …… …… | 10 ,, ,, ,, |
| | Tobacco …… …… …… | 130 ,, ,, ,, |
| | Potatoes …… …… …… | 50 ,, ,, ,, |
| | Groundnuts …… …… …… | 50 ,, ,, ,, |
| | Cotton …… …… …… | 30 ,, ,, ,, |
| | Stumping …… …… …… | 14 ,, ,, ,, |
| | All Other Crops …… …… | 10 ,, ,, ,, |

To all these figures has to be added 20 per cent. to allow for general farm work (overhead work) and 20 per cent. to allow for general work in connection with livestock if any has been kept. Where dairy stock have been kept, 300 work units have been allowed for every 20 milch cows and 300 work units for every 60 pigs, in addition to the 20 per cent. allowance.

Boys from 16 years upwards have been taken as a full work unit, women as half and picannins as one-third.

To show the use of work units the simple example may be taken of the average tobacco farm outlined on page 240.

| | Acreage | Work Units per acre | Total Work Units |
|---|---|---|---|
| Tobacco | 104 | 130 | 13,520 |
| Maize | 80 | 13 | 1,040 |
| Green Manure | 56 | 10 | 560 |
| Legume Hay | 10 | 10 | 100 |
| Other Crops | 18 | 10 | 180 |
| | 268 | x | 15,400 |

| | | | |
|---|---|---|---|
| Ranch Stock | 190 | Allow 20 per cent. of 15,400 | 3,080 |
| Dairy Cows | 7 | | |
| Oxen | 34 | | |
| Sheep | 21 | | |
| Goats | 5 | | |
| Pigs | 5 | | |
| Fowls | 25 | | |

Allow also 20 per cent. of 15,400 for general farm work ...... 3,080

Total ...... 21,560

Thus to cope with his farm work this farmer require $\frac{21,560}{275}$ equals 78 boys.

The divisor of 275 has been chosen because it has been found that, after allowance is made for holidays and Sundays, the Native in employment on these farms work an average of 275 days per year. It is reasonable to assume, then, that 275 work units are the equivalent of one man.

Having established such a list of work units, there are certain other factors which need to be taken into account. The amount of labour required to cultivate and harvest an acre of crops may vary according to (a) yield per acre, (b) type of soil, e.g., light or heavy, (c) size of farm, (d) degree of mechanisation, and (e) the efficiency of supervision.

Unfortunately, no survey of crop costing has yet been carried out on a sufficiently large scale to give an accurate answer to the first two of these factors. Moreover, farmers take on a number of boys each year and carry them irrespective of considerations of drought or plenty. And, with regard to soils, whilst an adjustment has been made, it is considered that the only effect of light soils has been to favour the tobacco-growing group. The differences between medium and heavy districts are, on English experience, slight, and certainly without significance.

With regard to farm size, again no adjustment has been possible.

The great majority of farms in this Colony are underdeveloped, and, in the absence of information from an agro-economic survey, the degree of development has been assumed constant.

The potential effects of mechanisation in reducing man hours per acre are obvious enough and are largely dependent on the tractor position. On the basis of replies from a large number of farmers, the following deductions have been made from the work units requirement for crops as ascertained above.

For a farm—

where all mechanical work is done by tractor power, 30%;
where 80% is tractor work, 25%;
where 60% is tractor work, 20%;
where 40% is tractor work, 15%;
where 20% is tractor work, 10%;
where 10% is tractor work, 5%.

This scale is generally applicable to all types of farms, although there will be considerable variation in individual instances.

## SECTION 5.

## LABOUR UTILISATION ON TOBACCO FARMS.

### European Labour.

Three of the farms visited were run by two men in partnership and one by four men in partnership. Twenty-three farmers each employed a manager, and one farmer eight managers, eight pupils and three assistants. In all, 20 pupils were employed on 13 farms and 45 assistants on 35 farms. Managers were paid varying rates, from £20 to £40 per month plus a percentage of profits varying from 10 per cent. to 25 per cent. of total net profits on tobacco. Keep and accommodation were provided in addition, and the average gross wage over the whole group was £1,020 per annum. The accepted rate for assistants is a total remuneration of about £600 per annum. Pupils do not normally receive any remuneration.

All farmers were closely questioned with regard to their managerial practice and this, together with personal observation, was used to classify the extent of supervision on each farm into one or other of three broad categories. There can be no doubt that this feature leaves much to be desired. Evidence of satisfactory job organisation is almost wholly negative, and to a large degree labour is allowed to carry on with a minimum of supervision. In 10 per cent. of cases management and supervision were regarded as satisfactory. In each of these the farmer or manager was what might be best described as a full-time working man, ever about the farm, and in most cases working alongside his boys (though not necessarily at the same job), rather than merely watching their activities. None of these men complained of a labour shortage, yet their employment of boys per acre of crop was in all instances below the average. In 84 per cent. of cases supervision was described as moderate to slack, and in 6 per cent. of cases as frankly inadequate.

In the lack of satisfactory organisation and supervision is to be found a good deal of the root cause of labour waste.

### Native Labour.

Having the above comments in mind, it is not surprising to find that, on the basis of the efficiency standards outlined in the previous section, 63 per cent. of the tobacco farms investigated showed a surplus of labour, a total surplus on 50 farms of 1,403 boys. It is interesting to note, in justification of the standards adopted, that with one exception, 54 per cent. of them (whilst not agreeing that they had wasted labour) opined that they were well satisfied with their labour position for the present development of the farm. The surplus, which varied from four boys to 83 boys, with an average of 28 boys, bore no discernible relationship to the degree of mechanisation.

Thirty-seven per cent. of farms were genuinely short of labour, in all 320 boys, or an average of 10 boys per farm. Ten of these farmers had stated that they had no shortage, whilst the remaining 20 estimated a greater degree of deficiency than that estimated under the method of analysis adopted.

In general it may be said that, taking the group as a whole, tobacco farmers are wasteful of labour and employ substantially more (25 per cent. on average) than they require for the present development of their farms. It must be emphasised, however, that most, if not all, farms are undeveloped, and that a very little degree of development would soon absorb the surplus unless accompanied by an increase in numbers employed.

## SECTION 6.

### Mechanisation on Tobacco Farms.

Satisfactory mechanisation of tobacco growing has yet to be achieved and it appears unlikely for a good number of years. Whilst some of the field operations lend themselves to mechanisation the later stages of production, priming, topping, suckering, reaping and grading cannot be successfully mechanised. This mass of manual work, covering as it does a long period of time, suggests that mechanisation of the preliminary field work will only tend to create an even greater unbalanced labour demand on the farm, unless profitable outlets for this labour can be obtained during the late winter and early summer months, from other crops or stock.

Tracing the progress of the crop from seedbed to auction floor, one finds only limited scope for mechanisation. The preparation of the seedbeds can be speeded up by the use of tractors, but the area involved is relatively small. The use of suitable irrigation plant can economise in labour for watering, but boys will still be required to tend the plants, hand weed the beds, etc.

The stumping and clearing of new lands can be mechanised, as can the ploughing and ridging. Various models of transplanters have proved satisfactory for planting out in the lands, and efficient row crop equipment is available for cleaning purposes. Priming, suckering and topping cannot be mechanical, neither can reaping. Use, however, can be made of lorries or tractor trailers for speedier transport of the leaves (and also wood) to the barns, but the large demand for manual workers will continue. A tying machine is at present being developed, but has not been thoroughly proved as yet. Curing must have the continued supervision of a skilled man, but his task can be made lighter by the use of modern furnaces and barn equipment. Grading is a job requiring skill and judgment, and it can be performed more efficiently in a properly equipped shed. Moving belts can cut down wasteful fetching and carrying of leaf. After baling, the crop is most conveniently transported to the floors or nearest siding on lorries.

Thus, no matter how heavily mechanised, the tobacco grower always has the peak period for manual labour during the reaping and grading seasons, and his labour will tend to be underemployed during the remainder of the year.

This restricted scope for mechanisation has influenced the investment in machinery by growers. Of the 80 tobacco farmers who supplied machinery inventories all but 14 owned at least one tractor (one of these was using a borrowed machine and 28 had two or more giving an average over the sample of 1⅓ tractors per grower. Of the average capitalisation per 100 acres arable on all machinery (£707 14s. 3d.) only a half (51.4 per cent.) was in the form of tractors (£363 8s. 3d.). The capital invested in machinery per 100 acres of summer arable varied from £3,719 at the one end to as little as £98 at the other. Twenty farms had over £1,000 invested in machinery, and the bulk of the remainder between £200 and £1,000.

The fact that tobacco farms are almost entirely on light land and that the tractors are required for haulage, means that wheeled tractors are practically universal, and only one track-layer was included in the sample (and in this instance the farmer also possessed a wheeled tractor). Two farmers used half-track Fordsons in addition to wheeled tractors and one farmer had a two-wheel tractor.

In a number of cases the hours worked by the tractors during the year were collected. These varied from as low as 400 up to 2,000 hours, with the majority over 1,000 hours. This indicates that most of the tractors are being utilised efficiently from a total usage point of view, but when, for example, a heavy tractor is used for a lot of haulage work, some of which is light, it is doubtful whether the saving of time and convenience would justify the high cost. In such cases a lighter tractor would be a better economic proposition.

A tractor does, of course, enable the field work to be started earlier and pushed on with greater speed than where oxen are used. A large proportion of the tractors were row crop models.

Over the whole sample, 68 per cent. of the ploughing was done by tractors, 44 per cent. of the heavy cultivations, 34 per cent. of the light cultivation, 41 per cent. of the row crop work, and 58 per cent. of harvesting work and farm haulage.

Most of the farms had lorries and/or vanettes. The lorries did a good proportion of the farm haulage and were used to transport the tobacco to the floors. A lorry, like a tractor, can be an expensive form of transport unless it is efficiently utilised. Vanettes are used as general run-abouts, but also do a good deal of load carrying.

Tobacco farms normally possess the usual range of field implements, and most have hammer mills and sundry other equipment depending on what other crops are grown and stock kept.

Most of the farmers in the sample are not planning any large increase in their mechanisation, rather tending to replace obsolete (especially ox) equipment and get further attachments for their tractors. Sixty per cent. of them stated their machinery position was satisfactory. Of the 40 per cent. who were not satisfied, one stated that he was short of capital, and the remainder that equipment was either too expensive or that the particular machinery they required was virtually unobtainable.

It is disturbing to note again in this connection that, in spite of the fact that these tobacco producers are better equipped than ever before, the work accomplished per worker shows no sign of increasing. One can find reasons for this:—

(1) The bad spread of crops (i.e., little variety) and the small numbers of livestock kept. The latter have a comparatively even labour requirement throughout the year. The increase in cropping, especially of tobacco with a very seasonable demand for labour, has undoubtedly resulted in more " wasted" labour in the "off season."

(2) Owing to the shortage of casual labour from sources other than the farm compound, farmers may be tending to keep

more regular workers throughout the year so as to be sure that they are available during rush periods.

(3) Because labour is frequently scarce, a farmer is sometimes reluctant to sack a boy who is slacking because of the difficulty of finding a replacement.

(4) Most Natives regard mechanical devices more as a means of easing their labour than for increasing their output.

Even when allowance is made for these factors, it is disappointing to find that in spite of a very considerable increase in expenditure on machinery, productivity per man is not increasing. On the other hand, if this machinery had not been bought, there may have been a more substantial decline in productivity.

## RECOMMENDATIONS.

The plain fact of the matter is that the bulk of the tobacco farmers are carrying labour surplus to the requirement of the present development of their farms. This may be necessary to cope with the peak period of work, but there are other ways of overcoming this. One method would be to work on a double shift basis, and another to offer overtime rates on a piece work basis. The peak labour requirement jobs are sufficiently short lived and sufficiently far apart to allow of the adoption of either method.

The second alternative is that of more diversified farming, and in particular the extension of livestock husbandry on these farms. This would not only assist in making much more effective use of labour in the production of food, but would confer considerable advantages in the build-up and maintenance of fertility and the stabilisation of the farming systems. The sowing of former tobacco land to leys, etc., instead of allowing it to revert, would also be of advantage. It is noteworthy in this connection that the farmers with diversified cropping and a substantial livestock side revealed little or no surplus of labour, and in several cases showed a deficiency.

Finally, the need for the farmers to give their boys at least basic, and in a number of cases more specialised training, and to foster in them an interest in what they do, is obvious to all but the industry which is most concerned.

# Southern Rhodesia Veterinary Report

FEBRUARY, 1950

**General.** Good rains fell in the Salisbury, Bulawayo, Umtali and Melsetter Districts with resulting improvement in water and grazing.

Very little rain fell in the Gwelo and Fort Victoria Districts and the position remained serious.

Cattle were reported to be in fair condition.

**Tick Life.** Tick Life continued very active in all Districts. The following quarantine notices were issued during the month: Salisbury, 2; Bulawayo, 10; Umtali, 3; Gwelo, 13; Fort Victoria, 3.

## SCHEDULED DISEASES:

1. **African Coast Fever.** No further cases occurred in the Salisbury District.

2. **Theileriosis.** Urungwe Reserve in the Salisbury District, and Plumtree Commonage in the Bulawayo District, are still in quarantine. Cases were also reported in the Umtali and Melsetter Districts.

3. **Anthrax.** The inoculation of all cattle in the Belingwe Reserve, Bulawayo District, continued.

4. **Foot and Mouth Disease.** Nil.

5. **Glanders or Farcy.** Nil.

6. **Heartwater.** 9 deaths occurred on Liebigs Ranch, Bulawayo District.

7. **Lungsickness (Contagious Pleuro Pneumonia of Cattle).** Nil.

8. **Mange in Horses, Mules, Donkeys and Camels.** Nil.

9. **Pyaemia or Epizootic Lymphangitis.** Nil.

10. **Redwater.** Cases were reported in all Districts as follows: Salisbury, 6; Bulawayo, 14; Umtali, 11; Gwelo, 1; Fort Victoria, 1; Melsetter, 8.

11. **Rinderpest.** Nil.

12. **Swine Erysipelas.** Nil.

13. **Swine Fever.** Nil.

14. **Quarter Evil.** Cases were reported in the following Districts: Salisbury, 3; Bulawayo, 5; Fort Victoria, 4.

15. **Tuberculosis.** 2 cows were found to be infected in the Bulawayo District.

16. **Scab.** Nil.

17. **Rabies.** Nil.

18. **Senkobo Disease.** Nil.

19. **Trypanosomiasis.** Further cases occurred in the Mkoto Reserve, Salisbury District; and 10 cases in the Chipinga District.

20. **Contagious Epididymitis and Vaginitis (Epi-Vag).** 11 new centres were discovered during February: 8 in Bulawayo; 1 in Umtali; and 2 in Fort Victoria. 20 farms were released.

21. **Lumpy Skin Disease.** 1 case occurred in the Salisbury District; and 1 in the Fort Victoria District. A few mild cases occurred in the Gwelo District.

22. **Contagious Abortion.** Cases were reported in the following Districts: Salisbury, 23; Bulawayo, 1; Gwelo, 20.

## SCHEDULED POULTRY DISEASES:

23. **Spirochaetosis.** 2 cases were confirmed in the Bulawayo District, and 1 in the Umtali District.

24. **Coccidiosis.** Nil.

25. **Fowl Typhoid.** Nil.

26. **Bacillary White Diarrhoea.** Has been confirmed in 5 flocks in the following Districts: Salisbury, 3; Bulawayo, 1; Umtali, 1. As a result, a 100 per cent. test of flocks is made before export of poultry is permitted.

27. **Tuberculosis.** Nil.

28. **Chicken Pox and Roup.** Infection was found in the Bulawayo and Umtali Districts.

## OTHER DISEASES:

29. **Gallsickness.** Cases occurred in all Districts. There has been heavy mortality at the Rhodes Matopo Estate in the Bulawayo District.

30. **Paratyphoid.** 8 cases were reported in the Bulawayo District.

31. **Geilsiekte.** Nil.

32. **Horse Sickness.** 3 cases were reported in the Bulawayo District. A disease simulating this condition appeared in the Salisbury District.

33. **Biliary.** Cases were reported in the Salisbury District.

34. **Sweating Sickness.** A few cases were reported in all Districts, with the exception of Umtali District.

35. **Opthalmia.** Prevalent in the Salisbury, Bulawayo and Melsetter Districts, with a few cases in the Gwelo and Fort Victoria Districts.

36. **Screw Worm.** Prevalent in the Salisbury, Bulawayo and Melsetter Districts, with a few cases in the Gwelo and Fort Victoria Districts.

37. **Coccidiosis.** Nil.

38. **Internal Parasitis.** Was reported in young stock in the Chipinga District.

## POISONING:

39. **Veld Poisoning.** Mortality occurred in all Districts with the exception of Umtali District.

40. **Mineral Poisoning.** Mortality from Arsenical Poisoning occurred in all Districts, with the exception of Umtali District.

**Mallein Testing.** In February, 1950, 46 Horses were tested. All passed.

**Tuberculin Testing.** In February, 1950, 15 Bulls; 19 Cows and 38 Heifers were tested. All passed.

## IMPORTATIONS:

**Bechuanaland Protectorate.** 898 Oxen (Slaughter); 52 Cows (Slaughter); 78 Bulls (Slaughter); 171 Sheep (Slaughter); 306 Goats (Slaughter); 44 Pigs (Slaughter).

**Union of South Africa.** 73 Cows and Calves (Breeding); 39 Geldings; 9 Horses and Mares; 22 Bulls (Breeding); 50 Sheep (Breeding).

**United Kingdom.** 1 Bull (Breeding).

## EXPORTATIONS:

**Portuguese East Africa.** 47 Cows and Calves (Breeding); 57 Oxen (Slaughter).

**Northern Rhodesia.** 19 Donkeys; 20 Pigs (Breeding).

**Union of South Africa.** 2 Mules and 4 Geldings.

## EXPORTATIONS—MISCELLANEOUS

**Union of South Africa.** 9,140 lbs. Sausage Casings; 10,659 lbs. Dripping.

**Northern Rhodesia.** 23,434 lbs. Bacon and Ham.

**Bechuanaland Protectorate.** 607 lbs. Bacon and Ham.

**Belgian Congo.** 536,987 lbs. Beef; 52,937 lbs. Offal; 1,042 lbs. Gammons; 546 lbs. Cooked Shoulders.

**Meat Products from Liebigs (Rhodesia) Ltd., West Nicholson.** Nil.

J. ADAMSON
Acting Director of Veterinary Services.

## MARCH, 1950

**General.** Good rains fell in the Salisbury, Bulawayo, Umtali and Melsetter Districts, with occasional showers in the Gwelo and Fort Victoria Districts. Grazing was good, but the water position cannot be considered satisfactory. Cattle were reported to be in good condition.

**Tick Life.** Tick life continued active in all districts. The following quarantine notices were issued during the month: Salisbury 14; Bulawayo 10; Gwelo 8; Fort Victoria 2.

### SCHEDULED DISEASES

1. **African Coast Fever.** The Salisbury District was released during the month.

2. **Theileriosis.** Cases were reported in all districts except Fort Victoria. All quarantine restrictions were withdrawn in the Plumtree area.

3. **Anthrax.** The inoculation of cattle in the Belingwe Reserve, Bulawayo District, continued.

4. **Foot and Mouth Disease.** Nil.

5. **Glanders or Farcy.** Nil.

6. **Heartwater.** A few cases were reported in the Bulawayo and Fort Victoria Districts.

7. **Lungsickness (Contagious Pleuro Pneumonia of Cattle.** Nil.

8. **Mange in Horses, Mules, Donkeys and Camels.** Nil.

9. **Pyaemia or Epizootic Lymphangitis.** Nil.

10. **Redwater.** Cases were reported in the following districts: Salisbury 1; Bulawayo 11; Umtali 33; Gwelo 1; Melsetter 11.

11. **Rinderpest.** Nil.

12. **Swine Erysipelas.** Nil

13. **Swine Fever.** Nil.

14. **Quarter Evil.** A few cases were reported in the Salisbury, Umtali and Gwelo Districts. There were 40 deaths in the Chilimanzi Reserve, Fort Victoria District.

15. **Tuberculosis.** Forty cases were diagnosed at Liebig's Factory, West Nicholson. Organised tests are being made in the Umtali District.

16. **Scab.** Nil.

17. **Rabies.** Nil.

18. **Senkodo Disease.** Nil.

19. **Trypanosomiasis.** Of 146 smears examined in the Chikwizo Reserve, Salisbury District, 35 were positive to *T. congolinse*

anl 1 to *T. vivax*. One case ocurred in the Melsetter District and six in the Chipinga District.

20. **Contagious Epididymitis and Vaginitis (Epivag).** Infection exists in the following veterinary districts: Salisbury, Bulawayo, Gwelo and Fort Victoria. In Salisbury District new infections were found on two farms and three farms were released. In the Bulawayo area the disease was found at three new centres. Elsewhere in the infected herds a decrease in the number of infected animals is reported.

21. **Lumpy Skin Disease.** Numerous mild cases were reported in the Salisbury District, and 101 cases in the Bulawayo District.

22. **Contagious Abortion.** Cases were confirmed in the Bulawayo, Umtali and Gwelo Districts.

## SCHEDULED POULTRY DISEASES

23. **Spirochactosis.** Nil.

24. **Coccidiosis.** Nil.

25. **Fowl Typhoid.** Confirmed in the Umtali District.

26. **Bacillary White Diarrhoea.** Was confirmed in the Bulawayo, Salisbury and Umtali Districts. Testing of flocks for export certificates was continued in the Salisbury, Bulawayo, Gwelo and Umtali Districts. The disease is being eliminated by the slaughter of reactors.

27. **Tuberculosis.** Diagnosed by post-mortem in the Bulawayo District.

28. **Chicken Pox and Roup.** Was diagnosed in the Bulawayo and Umtali Districts.

## OTHER DISEASES

29. **Gallsickness.** Cases were reported in all districts.

30. **Paratyphoid.** Nil.

31. **Geilsiekte.** Nil.

32. **Horse Sickness.** The following cases were reported: Salisbury 11; Bulawayo 2; Umtali 4; Fort Victoria 2.

33. **Biliary.** Nil.

34. **Sweating Sickness.** Prevalent in all districts.

35. **Opthalmia.** Prevalent in all districts.

36. **Screw Worm.** Prevalent in all districts

37. **Coccidiosis.** Was reported in Salisbury and Umtali Districts. In the latter district cattle affected showed marked recovery with mepacrine treatment.

38. **Internal Parasitis.** Still apparent in the Melsetter District, and was reported in the Umtali District.

39. **Stiff Sickness.** Reported in a severe form in the Bulawayo District. Many cases also occurred in the Gwelo District.

40. **Johnes Disease.** An imported bull was destroyed in the Salisbury District.

41. **Malignant Catarrh.** Four cases of semi-acute type were reported in the Umtali District.

42. **Foot Rot.** Five cases occurred in the Fort Victoria District.

## POISONING

43. **Veld Poisoning.** Mortality occurred in all districts with the exception of Fort Victoria.

44. **Mineral Poisoning.** The following deaths from Arsenical Poisoning were reported: Salisbury 21; Bulawayo 12; Umtali 16; Gwelo 4; Fort Victoria 5; Melsetter 5. The following deaths were also reported: Salisbury District, Arsenate of Lead 3, Salt 2; Melsetter District, Caustic 1.

**Mallein Testing.** In March, 1950, 52 horses, 2 mules and 21 donkeys were tested. All passed.

**Tuberculin Testing.** In March, 1950, 3 bulls, 2 cows and 29 heifers were tested. All passed.

## IMPORTATIONS

**Union of South Africa.** 6 bulls, 50 cows and calves breed, 10 horses and mares, 37 geldings, 2 mules and 1 pig breed.

**Northern Rhodesia.** 6 horses and mares.

**Bechuanaland Protectorate.** 1 cows and calves slaughter, 30 oxen slaughter, 55 pigs slaughter, 50 sheep slaughter.

## EXPORTATION

**Portuguese East Africa.** 61 oxen slaughter.

**Northern Rhodesia.** 15 mules.

**Union of South Africa.** 19 pigs breed.

## EXPORTATION—MISCELLANEOUS

**Union of South Africa.** 23,859 lbs. Sausage Casings, 18,057 lbs. Dripping, 8 oz. Gallstones.

**Belgian Congo.** 515,147 lbs. Beef; 48,741 lbs. Offal; 746 lbs. Sausage Casings; 1,354 lbs. Cooked Shoulders; 1,082 lbs. Mutton; 335 lbs. Poultry.

**Bechuanaland Protectorate.** 410 lbs. Smalls; 89 lbs. Sliced Bacon; 108 lbs. Cooked Shoulders; 22 lbs. Gammon.

**Northern Rhodesia.** 6,643 lbs. Middles; 8,972 lbs. Sides; 3,419 lbs. Smalls; 2,426 lbs. Cooked Shoulders; 1,414 lbs. Gammon; 941 lbs. Sliced Bacon; 52 lbs. Rolls.

**Meat Products from Liebig's (Rhodesia) Ltd., West Nicholson.**

**Union of South Africa.** 240 lbs. Corned Beef; 150 lbs. Vienna Sausages; 48 lbs. Steak and Kidney; 2,400 lbs. Braised Steak and Onions.

J. S. ADAMSON,
Acting Director of Veterinary Services.

# Rhodesian Milk Records

## OFFICIAL MILK RECORDS.

| Name of Cow. | Breed. | Age. | Milk in lbs. | B. Fat in lbs. | Average % B. Fat. | No. of Days. | Name and Address of Owner. |
|---|---|---|---|---|---|---|---|
| Exroom Amanda | Friesland | Jun. 3 years | 8984.50 | 333.73 | 3.72 | 300 | D. Mariel Blanc, Fairfield, P.B. 26, Melsetter. |
| Exroom Emma | Friesland | Jun. 4 years | 9741.00 | 365.48 | 3.75 | 300 | |
| Acquanetta | Jersey | 2 years | 6374.00 | 281.35 | 4.41 | 300 | M. W. Burras, Hertford Farm, Box 443, Bulawayo. |
| Schoongezicht Lonely | Jersey | Jun. 3 years | 6583.00 | 303.09 | 4.60 | 292 | |
| Schoongezicht Shasha II | Jersey | 2 years | 4854.00 | 257.15 | 5.30 | 300 | |
| Valentine of Belle Vue | Jersey | 2 years | 4186.00 | 215.96 | 5.16 | 267 | |
| Colonies Plaats Lodewyk's Alla Grietje IV | Friesland | Mature | 8937.00 | 331.08 | 3.70 | 300 | E. Butler, Woodlands, P.O. Shamva. |
| Colonies Plaats Myntje | Friesland | Jun. 4 years | 8191.00 | 302.06 | 3.69 | 300 | |
| Athole Rose | Jersey | 2 years | 8987.50 | 389.87 | 4.34 | 300 | F. Gebbie, South Lawn, P.B. 42, Marandellas. |
| Dalham Nellie | Jersey | 2 years | 6507.00 | 318.05 | 4.89 | 300 | |
| Groot Toetie | Jersey | Sen. 3 years | 8241.00 | 444.92 | 5.40 | 300 | |
| Gwentham Misty Morning | Jersey | Jun. 3 years | 5149.50 | 301.05 | 5.85 | 300 | |
| Voullaire Philomena | Jersey | 2 years | 3352.50 | 175.71 | 5.24 | 275 | S. Gelman, 27, Baxendale St., Bulawayo. |
| Voullaire Thyra | Jersey | 2 years | 4515.00 | 221.19 | 4.90 | 300 | |
| Matopo Star | Red Poll | Mature | 6480.60 | 212.60 | 3.28 | 300 | Government Experiment Station, P.B. 19K, Bulawayo. |
| Matopo Venetia | Red Poll | Jun 4 years | 4129.10 | 172.15 | 4.14 | 266 | |

# OFFICIAL MILK RECORDS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jewel's Crystal of Greyville | Guernsey | Mature | 5236.00 | 248.77 | 4.76 | 270 | E. J. Hards, Churchill Farm, Marandellas. |
| Molly's Gem of Wanganella | Guernsey | Sen. 3 years | 7787.00 | 328.44 | 4.22 | 270 | |
| Albert Vale Rosalie VIII | Friesland | Mature | 9464.00 | 280.99 | 2.97 | 300 | J. Jamieson, Criterion Farm, Box 217, Bulawayo. |
| Criterion Bokwagen II | Friesland | 2 years | 7853.00 | 257.23 | 3.28 | 300 | |
| Criterion Eerste I | Friesland | Mature | 12170.00 | 365.36 | 3.00 | 300 | |
| Criterion Esther II | Friesland | 2 years | 10008.00 | 303.19 | 3.03 | 300 | |
| Criterion Rosalie | Friesland | 2 years | 8334.00 | 274.96 | 3.30 | 300 | |
| Criterion Spinnekop V | Friesland | Jun. 4 years | 8921.00 | 332.59 | 3.73 | 300 | |
| Criterion Spinnekop VI | Friesland | 2 years | 8902.00 | 290.36 | 3.26 | 285 | |
| Prinsloo Myna | Friesland | Jun. 3 years | 7273.00 | 266.24 | 3.66 | 300 | |
| Fairseat Oxfordia's Barbette | Jersey | Sen. 4 years | 7106.50 | 292.94 | 4.12 | 300 | J. H. Keightley, Moorfields, Glendale. |
| M'sasa Elizabeth | Jersey | 2 years | 2992.00 | 194.69 | 6.51 | 240 | |
| M'sasa Joy | Jersey | Jun. 3 years | 3317.50 | 180.30 | 5.43 | 240 | |
| Leachdale Aletta | Friesland | Mature | 5543.00 | 163.23 | 2.94 | 300 | Meikles Trust & Invest. Co., Ltd., Leachdale Farm, Shangani. |
| Hillside Royal Rushy | Jersey | 2 years | 5645.50 | 265.91 | 4.71 | 300 | Mrs. E. L. Parkes, Box 159, Salisbury. |
| Middeldam Prim Jolly Girl | Jersey | Jun. 3 years | 5179.00 | 301.50 | 5.82 | 300 | |
| Astor of Safago | Guernsey | Jun. 4 years | 4024.50 | 180.84 | 4.49 | 300 | H. J. Quinton, Rumanje, P.B. 16A, Salisbury. |
| Ann of Nengwa | Guernsey | 23 months | 3879.50 | 153.75 | 3.96 | 300 | |
| May of Nengwa | Guernsey | 2 years | 3865.50 | 174.82 | 4.52 | 300 | |
| Mitchlin Beatrice | Friesland | Jun. 3 years | 7985.50 | 250.83 | 3.14 | 300 | D. Robertson Synd., Ltd., Hilda's Kraal, P.B. 158R, Bulawayo. |
| Mitchlin Dainty A II | Friesland | Mature | 7979.50 | 258.71 | 3.24 | 300 | |
| Mitchlin Dainty C's Butter Fly | Friesland | 2 years | 6151.00 | 202.26 | 3.29 | 300 | |
| Mitchlin Dainty D's Ardath | Friesland | Jun. 3 years | 7088.00 | 244.34 | 3.45 | 300 | |
| Mitchlin Delina's Belinda | Friesland | 2 years | 7143.50 | 221.16 | 3.09 | 300 | |

## OFFICIAL MILK RECORDS

| Name of Cow. | Breed. | Age. | Milk in lbs. | B. Fat in lbs. | Average % B. Fat. | No. of Days. | Name and Address of Owner. |
|---|---|---|---|---|---|---|---|
| Mitchlin Dignity D III | Friesland | 2 years | 6751.00 | 216.20 | 3.20 | 300 | P.B. 158R, Bulawayo. |
| Mitchlin Dorina E | Friesland | Jun. 3 years | 6991.50 | 229.10 | 3.28 | 300 | D. Robertson Synd., Ltd., Hilda's Kraal, |
| Mitchlin Lily's Countess | Friesland | Mature | 9872.00 | 325.08 | 3.29 | 300 | |
| Mitchlin Lily's Countess Alicia | Friesland | Jun. 4 years | 7810.00 | 283.03 | 3.62 | 300 | |
| Mitchlin Winona's Amy | Friesland | Jun. 4 years | 7837.00 | 303.82 | 3.88 | 300 | |
| Mitchlin Winona's Blossom | Friesland | 2 years | 8206.00 | 299.19 | 3.65 | 300 | |
| Colonies Plaats Bleske XII | Friesland | Sen. 3 years | 6600.20 | 244.59 | 3.71 | 284 | G. W. Robinson, P.O. Box 346, Salisbury. |
| Colonies Plaats De Hoop XXIV | Friesland | Jun. 3 years | 7182.00 | 273.45 | 3.81 | 300 | |
| Colonies Plaats Sytche VII | Friesland | Sen. 3 years | 6744.00 | 275.90 | 4.09 | 300 | |
| Whinburn Acorn | Friesland | Mature | 16708.80 | 563.35 | 3.37 | 300 | Major R. R. Sharp, Whinburn, Redbank, Bulawayo. |
| Whinburn Amazon | Friesland | Mature | 12521.50 | 424.19 | 3.39 | 300 | |
| Whinburn Baggage | Friesland | Sen. 4 years | 7598.50 | 247.55 | 3.26 | 300 | |
| Whinburn Betty | Friesland | Jun. 4 years | 6770.80 | 238.62 | 3.36 | 293 | |
| Whinburn Bramble | Friesland | Sen. 4 years | 8441.50 | 298.41 | 3.54 | 300 | |
| Whinburn Tarantella | Friesland | Mature | 9126.70 | 301.37 | 3.30 | 300 | |
| Whinburn Thyme | Friesland | Mature | 14842.10 | 490.33 | 3.30 | 300 | |
| Lynmouth Ambrochette | Jersey | 23 months | 2836.00 | 134.23 | 4.73 | 250 | S. M. Sinclair, Albany, P.B. Melsetter. |
| Lynmouth Crystal Star's Dusk | Jersey | 2 years | 2851.00 | 153.72 | 5.38 | 250 | |
| Lynmouth Elizabeth | Jersey | 23 months | 3235.00 | 203.74 | 6.33 | 250 | |
| Lynmouth Pandora Ambrosia | Jersey | 2 years | 3554.00 | 175.29 | 4.93 | 256 | |
| Fawkham Daydream II | Jersey | 2 years | 6120.70 | 251.56 | 4.11 | 283 | W. Smith-Baillie, P.B. 43, Marandellas. |

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|---|---|---|---|---|---|---|---|
| Meadows Standard Molly II | Jersey | 21 months | 5842.00 | 331.75 | 5.68 | 291 | Miss B. Tracey, P.O. Box 1750, Salisbury. |
| Meadows Standard's Winsome II | Jersey | 19 months | 4548.00 | 259.55 | 5.71 | 300 | |
| Willowtree Standard's Sarah | Jersey | Mature | 6714 00 | 373.50 | 5.56 | 300 | |
| Fawkham Blaney stone III | Jersey | 2 years | 6603.50 | 309.65 | 4.69 | 300 | C. G. Tracey, Handley Cross, P.B. Gatooma. |
| Gledsmuir Firefly's Oxford Dream | Jersey | Jun. 4 years | 5813.50 | 313.99 | 5.40 | 300 | |
| Gledsmuir Janet III | Jersey | Jun. 4 years | 6618.50 | 307.95 | 4.65 | 300 | Martin Tracey, Tawstock, Chakari, P.B. 21, Gatooma. |
| Gledsmuir Marie | Jersey | Jun. 4 years | 7453.00 | 345.94 | 4.64 | 300 | |

## SEMI-OFFICIAL MILK RECORDS

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Phoebe | G. Shorthorn | Mature | 6156.00 | 245.50 | 4.00 | 239 | F. J. Barry, Box 209, Umtali. |
| Quizzie | G. Afrikander | Mature | 6405.80 | 305.09 | 4.76 | 300 | |
| Very Nice II | G. Afrikander | Mature | 5498.00 | 278.54 | 5.07 | 228 | |
| Chow Chow II | G. Shorthorn | Mature | 6849.40 | 304.79 | 4.45 | 300 | J. H. Barry, Enavant, P.B. Umtali. |
| Bobijan | G. Friesland | 3 years | 7833.70 | 250.26 | 3.20 | 300 | J. A. Baxter, Glen Norah, Box 1368, Salisbury. |
| Clacupar Poland's Brandenia | P.B. Friesland | Mature | 8772.10 | 299.90 | 3.42 | 300 | |
| Ghandi | G. Friesland | 4 years | 6149.70 | 226.31 | 3.69 | 300 | |
| Tommy | G. Friesland | 2 years | 7647.70 | 234.21 | 3.06 | 300 | |
| Cinderella | G. Guernsey | 3 years | 6217.00 | 240.23 | 3.86 | 265 | J. R. Bedford, Poltimore, Marandellas. |
| Ingrid | G. Guernsey | 2 years | 6915.30 | 238.63 | 3.49 | 300 | |
| Joyce | G. Friesland | Mature | 8180.50 | 253.74 | 3.10 | 300 | A. Berry, Lendy, P.O. Marandellas. |
| D.45 | G. Friesland | Mature | 8471.80 | 290.61 | 3.43 | 300 | A. L. Bickle, Box 595, Bulawayo. |
| D.48 | G. Friesland | Mature | 10489.70 | 342.90 | 3.27 | 300 | |
| D.52 | G. Friesland | Mature | 6519.70 | 229.56 | 3.52 | 300 | |
| D.84 | G. Friesland | Mature | 7031.20 | 253.78 | 3.61 | 300 | |
| D.121 | G. Friesland | Mature | 8552.20 | 302.12 | 3.53 | 300 | |
| D.124 | G. Friesland | Mature | 9113.00 | 310.54 | 3.41 | 300 | |
| D.141 | G. Friesland | Mature | 9622.10 | 291.00 | 3.02 | 300 | |
| D.192 | G. Friesland | 4 years | 8123.00 | 258.60 | 3.18 | 300 | |
| D.194 | G. Friesland | 4 years | 9821.60 | 298.75 | 3.04 | 300 | |
| D.231 | G. Friesland | 3 years | 8278.00 | 272.73 | 3.29 | 300 | |
| D.234 | G Friesland | 3 years | 8177.20 | 284.04 | 3.47 | 300 | |
| D.246 | G. Friesland | 2 years | 6862.20 | 247.36 | 3.60 | 300 | |
| No. 74 | P.B. Friesland | Mature | 8898.70 | 309.24 | 3.36 | 300 | |
| Anna | G. Friesland | Mature | 8962.30 | 332.31 | 3.71 | 300 | Bothashof School, P.B. 164H, Salisbury. |
| Bleskie | G. Friesland | Mature | 7585.30 | 241.81 | 3.19 | 300 | |
| Botternoi | G. Friesland | Mature | 7780.50 | 285.30 | 3.67 | 300 | |
| Hartjie | G. Friesland | Mature | 6836.20 | 227.39 | 3.33 | 300 | |
| Kolletjie | G. Friesland | Mature | 7114.80 | 290.56 | 4.08 | 300 | |
| Nellie | G. Red Poll | Mature | 5288.70 | 231.25 | 4.37 | 300 | R. J. Bowyer, Dunsappie, Theydon. |
| Zonga Kapel III | P.B. Friesland | 3 years | 7630.00 | 242.36 | 3.10 | 300 | C. Boyd Clark, Mount Zonga, Inyazura. |

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|---|---|---|---|---|---|---|---|
| Grove Park Nancy | G. Friesland | 4 years | 8449.50 | 261.71 | 3.10 | 300 | Bradley Bros., P.O. Box 699. Bulawayo. |
| Lappie | G. Friesland | Mature | 5171.70 | 245.00 | 4.73 | 300 | J. D. Bredenkamp, P.O. Box 13, Salisbury |
| Tombi | G. Friesland | Mature | 6349.30 | 271.32 | 4.27 | 300 | |
| Winnie | G. Friesland | 3 years | 5642.80 | 225.85 | 4.00 | 261 | |
| No. 54 | G. Friesland | 3 years | 6789.00 | 251.36 | 3.70 | 300 | Brucehame Dairy, Box 21, Fort Victoria. |
| Diamond | G. Friesland | Mature | 8343.00 | 262.87 | 3.15 | 277 | M. W. Burras. Box 443, Bulawayo. |
| Nobby | G. Friesland | Mature | 6400.00 | 251.54 | 3.93 | 300 | |
| Emily | G. Friesland * | Mature | 9455.00 | 329.28 | 3.48 | 300 | E. Butler, Woodlands, P.O. Shamva. |
| Jupiter | G. Ayrshire | Mature | 6942.00 | 291.83 | 4.21 | 300 | L. E. O. Cary, Clovelly, P.O. Trelawney. |
| Bara Bara | G. Friesland | 2 years | 7887.20 | 316.39 | 4.01 | 300 | Mrs R. Jackson Clarke, Kingston Dairy, Gwelo. |
| Beauty | G. Friesland | 4 years | 10192.20 | 385.50 | 3.78 | 300 | |
| Vanguard | G. Friesland | 4 years | 9377.40 | 384.41 | 4.10 | 300 | |
| Patricia I | G. Friesland | Mature | 6267.00 | 246.65 | 3.94 | 268 | T. Cousins, P.B. 20, Gwelo. |
| Small | G. Friesland | Mature | 8579.00 | 312.55 | 3.64 | 239 | Cross & Son, P.B. T.208, Bulawayo. |
| No. 454 | G. Guernsey | Mature | 6335.50 | 260.51 | 4.11 | 300 | B. St. J. D. Downs, Safago, P.B. Gwelo. |
| No. 479 | G. Guernsey | 3 years | 5508.00 | 256.50 | 4.65 | 300 | |
| Benzie | G. Friesland | Mature | 5499.30 | 238.92 | 4.35 | 257 | J. N. Duff, Box 3, Marandellas. |
| Blue Bell | G. Friesland | Mature | 7070.20 | 277.24 | 3.92 | 300 | |
| Roly | G. Friesland | Mature | 5943.00 | 250.80 | 4.22 | 289 | |
| Spinach | G. Friesland | Mature | 6510.00 | 250.52 | 3.85 | 290 | |
| Tickie | G. Friesland | 3 years | 5494.40 | 230.41 | 4.19 | 266 | |
| Lady Jane | G. Friesland | Mature | 7623.00 | 305.58 | 4.01 | 253 | R. I. Edwards, Box 25, Chipinga. |
| Princess of Wales | G. Friesland | Mature | 8223.70 | 335.55 | 4.08 | 291 | |
| Royal Lady | G. Friesland | 4 years | 9480.00 | 408.07 | 4.30 | 300 | |
| No. 10 | G. Friesland | 3 years | 10050.00 | 322.63 | 3.21 | 300 | Mrs. H. C. Fischer, Olivia Farm, Headlands. |
| No. 12 | G. Friesland | 2 years | 7700.50 | 263.54 | 3.42 | 289 | |
| No. 235 | G. Friesland | Mature | 8886.50 | 312.28 | 3.51 | 274 | |
| No. 30 | G. Friesland | Mature | 8129.00 | 281.85 | 3.47 | 215 | R. Le S. Fischer, Wakefield, P.O. Headlands. |
| No. 89 | G. Friesland | Mature | 8174.00 | 285.94 | 3.50 | 300 | |
| No. 252 | G. Friesland | 3 years | 9455.00 | 347.28 | 3.67 | 300 | |
| No. 45 | G. Friesland | Mature | 11320.00 | 359.04 | 3.17 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 444 | G. Friesland | Mature | 7930.00 | 284.42 | 3.59 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 452 | G. Friesland | Mature | 6822.00 | 264.97 | 3.89 | 286 | |
| No. 506 | G. Friesland | Mature | 6545.00 | 254.21 | 3.89 | 296 | |
| No. 546 | G. Friesland | Mature | 6170.00 | 244.74 | 3.97 | 309 | |
| No. 558 | G. Friesland | Mature | 7663.00 | 321.27 | 4.19 | 288 | |
| No. 535 | G. Friesland | Mature | 5467.00 | 255.78 | 4.68 | 300 | |
| No. 560 | G. Friesland | 4 years | 6774.00 | 251.76 | 3.72 | 300 | |
| Lea | G. Friesland | Mature | 9936.80 | 362.02 | 3.64 | 300 | G. J. Franklin & Son, Box 105, Umtali. |
| Marandellas | G. Friesland | 3 years | 10256.80 | 423.50 | 4.13 | 300 | |
| Crab | G. Friesland | Mature | 8439.80 | 292.25 | 3.46 | 300 | P. Freeland, Lingfield, Gwelo. |
| Benzie | G. Friesland | Mature | 8594.80 | 310.81 | 3.62 | 289 | |
| Lulu No. 193 | G. Friesland | Mature | 8639.00 | 325.44 | 3.77 | 300 | |
| Maria II | G. Friesland | 3 years | 6332.50 | 247.30 | 3.91 | 300 | |
| Selukwe | G. Friesland | Mature | 8364.30 | 322.45 | 3.86 | 300 | |
| Umtali | G. Friesland | Mature | 7859.50 | 275.29 | 3.50 | 300 | |
| Vetkop II | G. Friesland | 3 years | 7260.20 | 261.19 | 3.60 | 300 | |
| No. 42 | G. Friesland | 3 years | 8451.80 | 288.14 | 3.41 | 300 | |
| No. 39 | G. Friesland | Mature | 13291.00 | 453.03 | 3.41 | 300 | S. Gelman, 27, Baxendale St., Bulawayo. |
| Audrey | G. Friesland | Mature | 8298.00 | 278.46 | 3.36 | 300 | Hon. H. V. Gibbs, Bonisa, Redbank, Bulawayo. |
| Baldie | G. Friesland | Mature | 8937.00 | 278.17 | 3.11 | 265 | |
| Gwen | G. Friesland | 3 years | 6087.00 | 229.79 | 3.78 | 300 | |
| Kath | G. Friesland | Mature | 9884.00 | 324.95 | 3.29 | 300 | |
| Merle | G. Friesland | Mature | 6448.00 | 238.45 | 3.70 | 300 | |
| Phyl | G. Friesland | Mature | 6746.00 | 256.64 | 3.80 | 300 | |
| Val | G. Friesland | Mature | 8346.00 | 327.21 | 3.93 | 300 | |
| Jess II | G. Guernsey | Mature | 5361.00 | 267.46 | 4.99 | 250 | E. J. Hards, Churchill, P.B. Marandellas. |
| Ardbennie II | G. Friesland | Mature | 7607.00 | 279.96 | 3.68 | 300 | D. J. Huddy, Box 718, Salisbury. |
| Connie | G. Friesland | Mature | 8934.50 | 335.86 | 3.76 | 291 | |
| Kelly | G. Friesland | 3 years | 7599.00 | 272.29 | 3.58 | 300 | |
| Kerry | G. Friesland | Mature | 7177.00 | 286.73 | 3.99 | 300 | |
| Koffie | G. Friesland | Mature | 7577.00 | 249.86 | 3.30 | 256 | |
| Lucky | G. Friesland | Mature | 7678.00 | 278.23 | 3.62 | 285 | |
| Merry | G. Friesland | Mature | 11191.00 | 370.49 | 3.31 | 300 | |

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|---|---|---|---|---|---|---|---|
| Fiesta | G. Friesland | 3 years | 6165.30 | 240.78 | 3.91 | 300 | L. Huddy, Box 924, Salisbury. |
| Gundaan II | G. Friesland | 4 years | 6008.20 | 234.49 | 3.90 | 300 | |
| Immigrant | G. Friesland | Mature | 7218.60 | 265.91 | 3.68 | 300 | |
| Jelasi | G. Friesland | Mature | 7505.70 | 256.82 | 3.42 | 300 | |
| Monika I | G. Friesland | Mature | 6751.70 | 281.81 | 4.17 | 300 | |
| Nancy | G. Guernsey | Mature | 4996.00 | 234.80 | 4.70 | 257 | |
| Ndima | G. Friesland | 4 years | 6905.10 | 227.38 | 3.29 | 300 | |
| Norton | G. Friesland | Mature | 6297.20 | 249.53 | 3.96 | 235 | |
| Pat | G. Friesland | 4 years | 5330.10 | 235.51 | 4.42 | 270 | |
| Rusapi | G. Friesland | Mature | 8739.40 | 299.97 | 3.43 | 300 | |
| Saturday | G. Friesland | Mature | 7594.90 | 278.39 | 3.67 | 300 | |
| Very Nice | G. Friesland | Mature | 6598.90 | 266.64 | 4.04 | 300 | |
| William | G. Friesland | 4 years | 7770.20 | 268.31 | 3.47 | 300 | |
| Zomba II | G. Friesland | 4 years | 6224.80 | 237.88 | 3.82 | 300 | |
| Cream | G. Friesland | Mature | 9356.50 | 302.44 | 3.23 | 300 | J. A. G. Hughes, Bains Hope, P.O. Melfort. |
| Moyeni Valiant Jinglebell | P.B. Jersey | Mature | 7175.00 | 380.59 | 5.30 | 300 | |
| J 18/1 | G. Friesland | Mature | 10161.00 | 381.84 | 3.76 | 300 | J. Jamieson, Box 217, Bulawayo. |
| J 56/1/2 | G. Friesland | 3 years | 9212.00 | 365.40 | 3.97 | 300 | |
| J 58/1/1 | G. Friesland | 2 years | 9497.00 | 320.01 | 3.37 | 300 | |
| J 59/1 | G. Friesland | Mature | 7717.00 | 246.73 | 3.19 | 269 | |
| J 60/1 | G. Friesland | Mature | 12694.00 | 418.53 | 3.30 | 300 | |
| J 64/1 | G. Friesland | Mature | 10876.00 | 354.76 | 3.26 | 300 | |
| J 175/1/4 | G. Friesland | 2 years | 11341.00 | 381.63 | 3.37 | 300 | |
| 12 A | G. Friesland | 2 years | 7397.00 | 230.67 | 3.12 | 300 | D. S. Kabot, Box 261, Bulawayo. |
| 32 A | G. Friesland | 3 years | 8577.00 | 261.76 | 3.05 | 300 | |
| 33 A | G. Friesland | Mature | 6802.00 | 238.27 | 3.50 | 300 | |
| 44 A | G. Friesland | Mature | 8915.00 | 327.70 | 3.68 | 300 | |
| 61 A | G. Friesland | Mature | 6643.00 | 248.28 | 3.74 | 300 | |
| No. 70 | G. Friesland | Mature | 5511.00 | 227.56 | 4.13 | 300 | |
| No. 74 A | G. Friesland | 2 years | 9828.00 | 309.15 | 3.15 | 300 | |
| No. 86 A | G. Friesland | 4 years | 6353.00 | 225.37 | 3.55 | 300 | |
| No. 38 | G. Friesland | Mature | 7877.00 | 266.28 | 3.38 | 300 | R. G. Kay, Box 606, Bulawayo. |
| No. 61 | G. Aberdeen-Angus | Mature | 7540.00 | 250.04 | 3.31 | 300 | |
| No. D. 15 | G. Friesland | Mature | 8578.20 | 330.13 | 3.85 | 300 | B. H. Kew, Box 972, Bulawayo. |
| No. 20 | G. Friesland | 4 years | 6965.40 | 286.32 | 4.11 | 300 | |
| No. K 29 | G. Friesland | Mature | 7016.50 | 275.69 | 3.93 | 300 | |
| No. K 41 | G. Friesland | 4 years | 6911.00 | 273.77 | 3.96 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Jane | G. Friesland | Mature | 7435.20 | 239.31 | 3.22 | 300 | Mrs. M. M. Krahner, Haydock Park, Banket. |
| Goldie | G. Friesland | Mature | 8825.70 | 296.86 | 3.36 | 300 | |
| Caroline | G. Friesland | Mature | 6210.80 | 304.75 | 4.91 | 300 | |
| No. 27 | G. Friesland | Mature | 6837.10 | 239.26 | 3.50 | 300 | H. T. Lay, P.B. 107C, Salisbury. |
| No. 28 | G. Friesland | Mature | 6336.60 | 286.07 | 4.52 | 300 | |
| Barbari | G. Jersey | Mature | 4126.80 | 237.27 | 5.75 | 300 | Lt.-Col. C. I. F. Maynard, Melfort, P.B. 112C, Salisbury. |
| Judy | G. Jersey | 2 years | 5972.60 | 289.68 | 4.85 | 300 | |
| Jane | G. Jersey | Mature | 7092.90 | 246.65 | 3.49 | 300 | |
| Rosa | G. Jersey | Mature | 5384.40 | 245.99 | 4.57 | 300 | |
| No. 21 | G. Friesland | Mature | 9098.00 | 276.02 | 3.03 | 300 | J. U. McCay, P.B. J181, Bulawayo. |
| No. 78 | G. Friesland | 4 years | 9894.00 | 350.50 | 3.54 | 300 | |
| No. 106 | G. Friesland | Mature | 8842.00 | 308.25 | 3.49 | 300 | |
| No. 124 | G. Friesland | 4 years | 7498.00 | 231.69 | 3.09 | 300 | |
| No. 125 | G. Friesland | 4 years | 7246.00 | 269.73 | 3.72 | 300 | |
| No. 127 | G. Friesland | 4 years | 7086.00 | 226.09 | 3.19 | 276 | |
| No. 130 | G. Friesland | 4 years | 8174.00 | 282.87 | 3.46 | 300 | |
| No. 133 | G. Friesland | 3 years | 6823.00 | 238.64 | 3.50 | 300 | |
| No. 143 | G. Friesland | 3 years | 6423.00 | 226.07 | 3.52 | 300 | |
| No. 144 | G. Friesland | 3 years | 6962.00 | 237.57 | 3.41 | 283 | |
| No. 148 | G. Friesland | 3 years | 5491.00 | 246.99 | 4.50 | 300 | |
| No. 150 | G. Friesland | 2 years | 7672.00 | 253.54 | 3.30 | 300 | |
| Bulawayo II | G. Friesland | Mature | 7475.30 | 306.73 | 4.13 | 300 | J. H. McLean, Box 161, Gwelo. |
| Skin | G. Friesland | Mature | 7867.80 | 308.24 | 3.92 | 300 | |
| Smit | G. Friesland | Mature | 6282.10 | 302.77 | 4.82 | 300 | |
| No. 23 | G. Friesland | Mature | 8497.30 | 298.67 | 3.50 | 300 | |
| Sally | G. Friesland | Mature | 7183.00 | 280.52 | 3.91 | 300 | L. McLean, Divide, Gwelo. |
| Helen | G. Ayrshire | Mature | 6155.00 | 277.23 | 4.50 | 193 | R. L. Moffat, Ormiston, Shangani. |
| Venus | G. Ayrshire | Mature | 5133.00 | 234.61 | 4.57 | 193 | |
| Reuter | G. Friesland | Mature | 5898.20 | 236.40 | 4.01 | 300 | Com. E. L. Morant, Box 741, Salisbury. |

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|---|---|---|---|---|---|---|---|
| No. 144 | G. Friesland | Mature | 6933.00 | 258.55 | 3.73 | 300 | F. B. Morrisby, Box 36, Gwelo. |
| No. 116 | G. Friesland | Mature | 7103.00 | 267.14 | 3.76 | 300 | |
| No. 131 | G. Friesland | Mature | 7844.00 | 268.29 | 3.42 | 300 | |
| Clynic | G. Friesland | Mature | 8563.00 | 291.94 | 3.41 | 294 | K. Norvall, Box 637, Bulawayo. |
| Eveline | G. Friesland | Mature | 9008.00 | 293.11 | 3.25 | 300 | |
| Komitch III | G. Friesland | 4 years | 6703.00 | 253.08 | 3.78 | 288 | |
| Luveve | G. Friesland | Mature | 6208.00 | 234.38 | 3.78 | 292 | |
| Minhinick Thalia | P.B. Friesland | 2 years | 7165.00 | 234.69 | 3.28 | 300 | |
| Mziki | G. Friesland | Mature | 7661.00 | 271.55 | 3.54 | 300 | |
| Sisi II | G. Friesland | 3 years | 6034.00 | 244.28 | 4.05 | 300 | |
| Spoof | G. Friesland | Mature | 7368.00 | 241.04 | 3.27 | 210 | |
| Vegetable III | G. Friesland | 4 years | 7909.00 | 278.26 | 3.52 | 295 | |
| Zenda II | G. Friesland | 2 years | 7894.00 | 258.63 | 3.28 | 300 | |
| Babs | G. Friesland | Mature | 7755.10 | 305.94 | 3.94 | 286 | E. Palmer, Ferndale, Penhalonga. |
| Betty | G. Friesland | Mature | 7956.30 | 283.26 | 3.56 | 278 | |
| Chbakera | G. Shorthorn | Mature | 10830.90 | 389.02 | 3.59 | 300 | |
| Jane | G. Friesland | Mature | 9011.40 | 389.69 | 4.32 | 300 | |
| Katie | G. Shorthorn | 4 years | 6795.60 | 249.95 | 3.68 | 244 | |
| Queenie III | G. Friesland | 2 years | 6726.10 | 274.81 | 4.08 | 300 | |
| Sheila | G. Friesland | Mature | 7711.40 | 254.06 | 3.29 | 286 | |
| Topsy | G. Friesland | Mature | 7807.80 | 266.54 | 3.41 | 255 | |
| No. 12 | G. Friesland | 3 years | 5433.90 | 230.82 | 4.25 | 256 | |
| Rounders | G. Friesland | Mature | 13090.00 | 490.99 | 3.75 | 300 | Mrs. M. Parsons, P.O. Box 7, Bulawayo. |
| Mandinema | G. Friesland | 4 years | 6243.70 | 230.70 | 3.69 | 300 | Red Valley Estate, Lushington, Marandellas. |
| Jennifer II | G. Friesland | 4 years | 6287.70 | 228.70 | 3.64 | 300 | |
| Petal II | G. Friesland | 4 years | 7117.40 | 244.96 | 3.44 | 300 | |
| Ruth | G. Friesland | Mature | 7130.30 | 273.38 | 3.84 | 300 | G. W. Robinson, Marimba Farm, Box 346, Salisbury. |
| Agnes | G. Ayrshire | Mature | 5173.50 | 245.81 | 4.75 | 250 | S. M. Sinclair, Albany, P.B. Melsetter. |
| No. G 13 | G. Ayrshire | Mature | 7381.00 | 276.24 | 3.74 | 300 | J. R. Stewart & Sons, Ltd., Battle Farm, P.O. Shangani. |
| No. G 48 | G. Ayrshire | 2 years | 6931.00 | 239.77 | 3.46 | 300 | |
| Ann | G. Friesland | 3 years | 7751.60 | 281.59 | 3.63 | 300 | H. Swaine, Box 131, Gwelo. |
| Black Poll III | G. Friesland | Mature | 7643.50 | 253.22 | 3.31 | 300 | |
| Dark | G. Friesland | 3 years | 6496.60 | 231.47 | 3.56 | 300 | |
| Speck | G. Friesland | 4 years | 7035.50 | 270.02 | 3.84 | 300 | |
| Violet | G. Friesland | Mature | 8766.60 | 279.05 | 3.20 | 300 | |
| Winnie | G. Friesland | Mature | 7038.40 | 230.37 | 3.27 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Apanamoney | G. Friesland | Mature | 10247.00 | 361.79 | 3.53 | 300 | E. Tapson Trust, Ltd., Lesapi Falls, Rusape. |
| Black | G. Friesland | Mature | 8605.00 | 349.89 | 4.07 | 300 | |
| Broom | G. Friesland | 3 years | 6751.00 | 234.92 | 3.49 | 244 | |
| Esnight | G. Friesland | Mature | 9330.00 | 328.18 | 3.52 | 300 | |
| France | G. Friesland | 2 years | 6949.00 | 284.72 | 4.10 | 300 | |
| Goley | G. Friesland | 3 years | 8333.00 | 352.29 | 4.23 | 300 | |
| Manduna | G. Friesland | Mature | 10020.00 | 370.23 | 3.69 | 300 | |
| Munyengwa | G. Friesland | 4 years | 9096.00 | 303.45 | 3.34 | 300 | |
| Peter | G. Friesland | Mature | 11078.00 | 353.83 | 3.19 | 300 | |
| Watsonia II | G. Friesland | Mature | 8296.00 | 316.77 | 3.82 | 300 | |
| Tokas | G. Friesland | Mature | 6329.30 | 250.86 | 3.96 | 300 | L. Taylor, Box 55, Selukwe. |
| Gladys | G. Friesland | Mature | 10242.90 | 386.09 | 3.21 | 284 | A. W. Tennent, Kelvin, Headlands. |
| Sheena | G. Friesland | Mature | 6103.70 | 243.79 | 4.00 | 253 | |
| No. 27 | G. Friesland | 4 years | 6233.60 | 261.84 | 4.20 | 248 | |
| No. 42 | G. Friesland | 3 years | 5828.30 | 226.22 | 3.88 | 234 | |
| Mareta | G. Friesland | Mature | 7014.70 | 249.38 | 3.56 | 300 | |
| Nancy VII | G. Friesland | Mature | 7000.00 | 251.74 | 3.60 | 290 | P. S. Timms, Chitora, Rusape. |
| Peggy | G. Friesland | Mature | 9718.70 | 311.39 | 3.20 | 300 | Mrs. M. Turnbull, Box 479, Bulawayo. |
| Lena | G. Friesland | Mature | 8161.90 | 287.51 | 3.52 | 300 | |
| Moth | G. Friesland | Mature | 7966.80 | 308.11 | 3.87 | 284 | |
| Starlight | G. Friesland | 3 years | 7280.70 | 239.86 | 3.29 | 300 | |
| Betterpewter II | G. Friesland | Mature | 8299.00 | 290.12 | 3.50 | 300 | R. O. Waldschutz, Mere Farm, Box 27, Marandellas. |
| Lucia II | G. Friesland | 4 years | 7603.00 | 287.75 | 3.79 | 270 | |
| Olive | G. Friesland | Mature | 7419.80 | 232.33 | 3.13 | 300 | N. W. Whitehead, Lonsdale Farm, P.O. Matopos. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Gallon | G. Friesland | Mature | 7261.70 | 235.94 | 3.25 | 300 | D. A. Allan, Doctors Gift, P.O. Theydon. |
| Rita | G. Friesland | Mature | 12440.10 | 427.08 | 3.43 | 300 | |
| Ten | G. Friesland | Mature | 10641.40 | 338.61 | 3.19 | 281 | |
| Zindoro | G. Friesland | Mature | 7433.90 | 268.65 | 3.61 | 300 | |
| Diana | G. Friesland | Mature | 8579.90 | 310.52 | 3.62 | 300 | Mrs. M. Allan, Doctors Gift, P.O. Theydon. |
| No. 20 | G. Friesland | Mature | 6495.00 | 259.86 | 4.00 | 300 | G. R. Anderson, Warrender Farm, Box 8, Gwelo. |
| Bessbrook | G. Friesland | Mature | 6242.00 | 231.78 | 3.71 | 300 | R. A. Ballantyne, Box 801, Salisbury. |
| Beit | G. Friesland | Mature | 7596.00 | 271.44 | 3.62 | 300 | |
| Bonsella | G. Friesland | Mature | 6360.00 | 284.49 | 4.55 | 300 | |
| Eagle | G. Friesland | Mature | 6714.00 | 271.40 | 4.04 | 300 | |
| Zimbabwe | G. Shorthorn | Mature | 6227.00 | 260.65 | 4.19 | 300 | |
| Zuze | G. Shorthorn | Mature | 6003.00 | 231.81 | 3.86 | 300 | |
| Bella | G. Shorthorn | Mature | 9395.50 | 395.08 | 4.20 | 300 | F. J. Barry, Box 209, Umtali. |
| Bella II | G. Shorthorn | 3 years | 6048.70 | 240.11 | 3.97 | 300 | |
| Mafuta II | G. Shorthorn | Mature | 7465.30 | 303.38 | 4.06 | 300 | |
| Dairy II | G. Shorthorn | Mature | 6441.40 | 273.61 | 4.25 | 227 | J. H. Barry, Box 209, Umtali. |
| Anniversary | G. Friesland | Mature | 7917.40 | 271.59 | 3.43 | 300 | J. A. Baxter, Box 1368, Salisbury. |
| Flicka | G. Friesland | 4 years | 6318.70 | 243.10 | 3.85 | 300 | |
| Flower | G. Friesland | Mature | 7428.20 | 267.83 | 3.61 | 300 | |
| Lucy | G. Friesland | Mature | 7616.50 | 287.43 | 3.77 | 300 | A. Berry, "Lendy," Marandellas. |
| D.2 | G. Friesland | Mature | 7365.10 | 255.20 | 3.46 | 300 | A. L. Bickle, P.O. Box 595, Bulawayo. |
| D.26 | G. Friesland | Mature | 7071.40 | 239.59 | 3.36 | 288 | |
| D.58 | G. Friesland | Mature | 9307.50 | 343.66 | 3.69 | 300 | |
| D.105 | G. Friesland | Mature | 9079.40 | 340.39 | 3.78 | 300 | |
| D.110 | G. Friesland | Mature | 9154.80 | 291.03 | 3.18 | 300 | |
| D.177 | G. Friesland | Mature | 8122.80 | 290.03 | 3.57 | 300 | |
| D.236 | G. Friesland | 4 years | 7964.10 | 274.18 | 3.48 | 300 | |
| D.244 | G. Friesland | 3 years | 7804.00 | 263.32 | 3.36 | 300 | |
| D.245 | G. Friesland | 3 years | 5940.80 | 236.66 | 3.89 | 300 | |
| D.261 | G. Friesland | 3 years | 7379.80 | 229.07 | 3.10 | 300 | |
| D.264 | G. Friesland | 2 years | 8830.70 | 278.35 | 3.16 | 300 | |
| D.269 | G. Friesland | 2 years | 6811 90 | 228.59 | 3.36 | 300 | |
| D.286 | G. Friesland | 2 years | 8412.60 | 285.74 | 3.40 | 268 | |
| Dirko Mooirooster II | P.B. Friesland | 3 years | 7383.00 | 265.95 | 3.60 | 300 | |
| Dirko Rena | P.B. Friesland | 4 years | 7631.70 | 246.20 | 3.22 | 300 | |
| Mary | G. Friesland | 3 years | 8744.80 | 345.10 | 3.95 | 300 | |

### SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| **Judy II** | **G. Friesland** | **Mature** | 6180.50 | 227.14 | 3.68 | 300 | Mrs. M. Black, Burnside, P.O. Bindura. |
| **Jutice** | **G. Friesland** | **Mature** | 6959.00 | 229.03 | 3.29 | 300 | |
| **Punch II** | **G. Friesland** | **Mature** | 7464.00 | 267.53 | 3.58 | 300 | |
| **Whitetop** | **G. Friesland** | **Mature** | 8629.50 | 269.03 | 3.12 | 300 | J. P. Bonett, P.B. 170R, Bulawayo. |
| **No. 263** | **G. Friesland** | **Mature** | 7763.00 | 283.74 | 3.65 | 300 | C. Boyd Clark, Mount Zonga, Inyazura. |
| **No. 271** | **G. Friesland** | **Mature** | 8414.00 | 280.05 | 3.33 | 300 | |
| **Dirko Jill** | **P.B. Friesland** | **Mature** | 6662.00 | 258.57 | 3.88 | 276 | |
| **Truant III** | **G. Friesland** | **Mature** | 8707.00 | 314.52 | 3.61 | 264 | |
| **Zonga Jess III** | **P.B. Friesland** | **3 years** | 7118.00 | 228.16 | 3.21 | 300 | |
| **Grove Park Cecilia** | **G. Friesland** | **2 years** | 7755.00 | 276.91 | 3.57 | 300 | C. S. Bradley, Box 699, Bulawayo. |
| **Grove Park Hilda** | **G. Friesland** | **Mature** | 10684.00 | 405.17 | 3.79 | 300 | |
| **Grove Park Lizzy** | **G. Friesland** | **Mature** | 6936.00 | 248.13 | 3.59 | 300 | |
| **Grove Park May** | **G. Friesland** | **Mature** | 7853.00 | 278.18 | 3.54 | 300 | |
| **Nellie** | **G. Red Poll** | **4 years** | 6081.80 | 300.93 | 4.94 | 300 | J. D. Bredenkamp, Box 13, Salisbury. |
| **New One** | **G. Friesland** | **4 years** | 7371.80 | 293.46 | 4.14 | 300 | |
| **Vrystaat** | **G. Friesland** | **3 years** | 6319.60 | 254.05 | 4.02 | 300 | |
| **Nyama** | **G. Friesland** | **Mature** | 6806.00 | 239.79 | 3.52 | 300 | Miss N. Brereton, Coolmoreen, Gwelo. |
| **Annabell** | **G. Friesland** | **3 years** | 8833.50 | 291.01 | 3.41 | 300 | B.S.A. Co. Mazoe Citrus Estate, Mazoe. |
| **Bell** | **G. Friesland** | **Mature** | 6508.00 | 227.88 | 3.50 | 242 | |
| **Citrus** | **G. Friesland** | **3 years** | 8802.00 | 312.92 | 3.56 | 300 | |
| **Matross** | **G. Friesland** | **Mature** | 10114.00 | 328.19 | 3.24 | 300 | |
| **No. 33** | **G. Friesland** | **3 years** | 6165.00 | 233.40 | 3.79 | 300 | Bruceham Dairy, Box 21, Fort Victoria. |
| **No. 120** | **G. Friesland** | **Mature** | 7334.80 | 266.12 | 3.63 | 300 | |
| **No. 118** | **G. Friesland** | **Mature** | 7059.00 | 227.77 | 3.23 | 300 | |
| **Darkie** | **G. Jersey** | **Mature** | 5669.00 | 243.68 | 4.30 | 300 | M. W. Burras, Box 443, Bulawayo. |
| **Bess** | **G. Friesland** | **Mature** | 8751.00 | 305.88 | 3.50 | 300 | E. W. Butler, "Woodlands," P.O. Shamva |
| **Rachel** | **G. Friesland** | **Mature** | 9751.00 | 339.18 | 3.29 | 300 | |
| **Twinkle** | **G. Friesland** | **Mature** | 10491.00 | 326.56 | 3.11 | 300 | |
| **Maisie** | **G. Ayrshire** | **4 years** | 6814.00 | 235.92 | 3.46 | 300 | L. E. O. Cary, "Clovelly," Trelawney. |
| **Mona** | **G. Ayrshire** | **Mature** | 8105.00 | 263.96 | 3.25 | 300 | |

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|---|---|---|---|---|---|---|---|
| Mayflower | G. Friesland | Mature | 9203.50 | 288.95 | 3.14 | 300 | T. Cousins, P.B. 20, Gwelo. |
| Oubliette | G. Friesland | Mature | 8136.00 | 293.71 | 3.61 | 300 | |
| Dorothy | G. Friesland | Mature | 8050.00 | 256.43 | 3.19 | 300 | Cross & Son, Box 953, Bulawayo. |
| White | G. Friesland | Mature | 7393.00 | 243.57 | 3.29 | 289 | |
| Jean | G. Friesland | 4 years | 9569.30 | 338.69 | 3.54 | 252 | J. V. Danckwerts, P.O. Box 989, Salisbury. |
| Joan | G. Friesland | 3 years | 7563.70 | 241.30 | 3.19 | 300 | |
| Mary Joy | G. Friesland | 4 years | 6687.60 | 252.66 | 3.77 | 300 | |
| Nona | G. Friesland | 4 years | 6491.30 | 235.10 | 3.62 | 278 | |
| Ruth | G. Friesland | 3 years | 8344.80 | 282.75 | 3.38 | 300 | |
| Marita | G. Friesland | Mature | 7378.80 | 248.35 | 3.36 | 300 | A. B. Dobson, Endeavour Farm, Norton. |
| No. 2 | G. Guernsey | 3 years | 5234.00 | 231.49 | 4.42 | 300 | B. St. J. D. Downes, Safago Farm, P.B. Gwelo. |
| No. 332 | G. Guernsey | Mature | 8851.00 | 296.59 | 3.35 | 300 | |
| No. 335 | G. Guernsey | Mature | 9431.00 | 247.17 | 3.68 | 300 | |
| No. 406 | G. Guernsey | Mature | 8460.00 | 301.29 | 3.56 | 282 | |
| No. 424 | G. Guernsey | Mature | 6002.00 | 245.43 | 4.09 | 241 | |
| No. 487 | G. Guernsey | 4 years | 5387.00 | 225.00 | 4.11 | 267 | |
| Maggie | G. Friesland | Mature | 5845.80 | 226.71 | 3.88 | 300 | J. N. Duff, Box 3, Marandellas. |
| No. 1 | G. Friesland | Mature | 9589.50 | 329.91 | 3.44 | 274 | Mrs. D. M. Edwards, Box 11, Eiffel Flats |
| Jean | G. Friesland | Mature | 8474.50 | 285.15 | 3.36 | 300 | |
| Que Que | G. Friesland | Mature | 9500.00 | 300.67 | 3.16 | 261 | |
| Umsweswe | G. Friesland | Mature | 6526.00 | 228.73 | 3.50 | 255 | |
| Suzanne IV | G. Friesland | 4 years | 6762.00 | 225.24 | 3.33 | 300 | Mrs. M. Everard, Castle Zonga, Inyazura |
| No. 1 | G. Friesland | 3 years | 8007.00 | 246.38 | 3.08 | 262 | |
| No. 243 | G. Friesland | Mature | 6311.00 | 238.75 | 3.78 | 300 | |
| No. 272 | G. Friesland | Mature | 8117.00 | 291.85 | 3.60 | 300 | |
| No. 340 | G. Friesland | 4 years | 6361.00 | 229.04 | 3.60 | 266 | |
| No. 370 | G. Friesland | 4 years | 7083.00 | 245.08 | 3.46 | 300 | |
| No. 7 | G. Friesland | 3 years | 7890.50 | 270.80 | 3.45 | 270 | Mrs. H. C. Fischer, Olivia Farm, Headlands. |
| No. 11 | G. Friesland | 3 years | 10353.00 | 352.46 | 3.40 | 279 | |
| No. 16 | G. Friesland | 2 years | 8718.50 | 319.49 | 3.66 | 300 | |
| No. 78 | G. Friesland | Mature | 9639.00 | 326.99 | 3.40 | 300 | |
| No. 160 | G. Friesland | 4 years | 9803.50 | 363.35 | 3.71 | 300 | |
| No. 269 | G. Friesland | Mature | 8434.00 | 270.64 | 3.21 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 59 | G. Friesland | Mature | 8053.00 | 252.70 | 3.14 | 259 | R. le S. Fischer, Wakefield, Headlands. |
| No. 83 | G. Friesland | Mature | 7824.00 | 258.14 | 3.30 | 300 | |
| No. 100 | G. Friesland | Mature | 8143.00 | 320.17 | 3.93 | 227 | |
| No. 193 | G. Friesland | Mature | 9215.00 | 325.55 | 3.53 | 300 | |
| No. 204 | G. Friesland | 4 years | 8721.00 | 308.74 | 3.43 | 300 | |
| No. 237 | G. Friesland | 4 years | 7018.00 | 265.42 | 3.78 | 237 | |
| No. 241 | G. Friesland | 3 years | 5830.00 | 229.36 | 3.93 | 262 | |
| No. 274 | G. Friesland | 3 years | 7216.00 | 249.38 | 3.46 | 289 | |
| No. 277 | G. Friesland | 3 years | 8260.00 | 314.90 | 3.81 | 293 | |
| No. 56 A | G. Friesland | 2 years | 5111.00 | 229.84 | 4.50 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 395 | G. Friesland | Mature | 8624.00 | 385.39 | 4.47 | 300 | |
| No. 443 | G. Friesland | Mature | 7080.00 | 269.61 | 3.81 | 300 | |
| No. 467 | G. Friesland | Mature | 8601.00 | 276.62 | 3.21 | 300 | |
| No. 517 | G. Friesland | Mature | 6178.00 | 234.14 | 3.80 | 268 | |
| No. 582 | G. Friesland | 4 years | 6216.00 | 229.42 | 3.68 | 300 | |
| No. 583 | G. Friesland | 4 years | 7573.00 | 281.17 | 3.71 | 300 | |
| Adam | G. Friesland | Mature | 8603.90 | 363.71 | 4.23 | 300 | G. J. Franklin & Son, Box 105, Umtali. |
| Budzi | G. Friesland | Mature | 6678.40 | 261.83 | 3.92 | 267 | |
| Cigar | G. Friesland | Mature | 8853.20 | 348.99 | 3.94 | 290 | |
| Claisen | G. Shorthorn | Mature | 11276.90 | 495.12 | 4.39 | 300 | |
| February | G. Friesland | 2 years | 8765.50 | 355.67 | 4.06 | 300 | |
| Fourpence | G. Friesland | 3 years | 9204.30 | 346.48 | 3.76 | 300 | |
| June II | G. Shorthorn | Mature | 5583.70 | 226.84 | 4.06 | 300 | |
| January | G. Friesland | 2 years | 7814.10 | 351.99 | 4.50 | 300 | |
| Jean | G. Guernsey | Mature | 5957.10 | 231.92 | 3.89 | 300 | |
| Jimmy | G. Friesland | Mature | 6915.20 | 249.79 | 3.61 | 281 | |
| Lidia | G. Shorthorn | Mature | 7714.00 | 313.44 | 4.06 | 300 | |
| Maine II | G. Red Poll | 4 years | 9018.20 | 361.29 | 4.01 | 300 | |
| Makoni I | G. Shorthorn | Mature | 7691.00 | 277.81 | 3.61 | 300 | |
| March | G. Guernsey | 4 years | 6092.60 | 232.50 | 3.82 | 300 | |
| Marion | G. Guernsey | Mature | 5511.50 | 256.49 | 4.65 | 300 | |
| May | G. Red Poll | 4 years | 6167.30 | 265.70 | 4.30 | 300 | |
| Max | G. Friesland | 5 years | 9636.30 | 351.81 | 3.65 | 300 | |
| Mgurwe II | L.R. Shorthorn | Mature | 7705.10 | 302.98 | 3.93 | 257 | |
| M'punzi | G. Common | Mature | 9801.70 | 396.59 | 4.05 | 295 | |
| Mona | G. Friesland | 3 years | 8134.90 | 294.06 | 3.61 | 243 | |
| Naomi | G. Friesland | 4 years | 9946.40 | 407.06 | 4.09 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Natarara | G. Friesland | Mature | 8766.60 | 352.90 | 4.03 | 277 | G. J. Franklin & Son. Box 105, Umtali. |
| Odzi | G. Friesland | 3 years | 6558.70 | 276.15 | 4.21 | 300 | |
| Penhalonga II | G. Shorthorn | Mature | 6849.70 | 294.22 | 4.30 | 262 | |
| Queenie | G. Guernsey | 4 years | 7779.10 | 367.97 | 4.73 | 300 | |
| Rhodesia | G. Friesland | 2 years | 7527.90 | 310.02 | 4.12 | 300 | |
| Sally | G. Shorthorn | Mature | 8689.70 | 315.57 | 3.63 | 234 | |
| Shimba Tambo | G. Friesland | Mature | 7197.20 | 324.41 | 4.51 | 300 | |
| Silk | G. Friesland | Mature | 12058.90 | 425.96 | 3.53 | 300 | |
| Spitfire | G. Friesland | Mature | 10495.30 | 361.42 | 3.44 | 300 | |
| Spotty | G. Friesland | 4 years | 10122.20 | 422.06 | 4.17 | 300 | |
| Thipiri II | G. Friesland | Mature | 12005.30 | 534.51 | 4.45 | 300 | |
| Carnation | G. Friesland | Mature | 6428.10 | 259.31 | 4.03 | 300 | P. Freeland. Lingfield. Gwelo. |
| Flo II | G. Friesland | Mature | 7908.90 | 298.17 | 3.77 | 300 | |
| Jane | G. Friesland | Mature | 7261.20 | 276.59 | 3.81 | 300 | |
| Munga | G. Friesland | Mature | 7871.00 | 294.64 | 3.74 | 300 | |
| New Farm | G. Friesland | Mature | 6181.60 | 233.12 | 3.77 | 300 | |
| Salisbury | G. Friesland | Mature | 7579.90 | 267.80 | 3.53 | 300 | |
| Silver II | G. Friesland | Mature | 7786.00 | 258.38 | 3.32 | 300 | |
| Susie | G. Friesland | Mature | 9477.80 | 294.67 | 3.11 | 300 | |
| Tombie | G. Friesland | 4 years | 8980.20 | 309.58 | 3.45 | 300 | |
| No. 420 | G. Guernsey | Mature | 6846.60 | 307.58 | 4.49 | 300 | |
| Whiteface | G. Friesland | Mature | 6592.40 | 268.15 | 4.07 | 300 | G. G. Futter. Marjoribanks. P.O. Gwelo. |
| No. 10 | G. Friesland | Mature | 6957.60 | 260.15 | 3.74 | 300 | |
| No. 10 | G. Friesland | Mature | 9584.50 | 293.85 | 3.07 | 300 | S. Gelman. 27. Baxendale Street, Bulawayo. |
| Bankie | G. Friesland | 4 years | 9352.00 | 292.31 | 3.13 | 300 | Hon. H. V. Gibbs, P.B. 52L, Bulawayo. |
| Connie | G. Friesland | Mature | 9113.00 | 308.42 | 3.38 | 300 | |
| Eggs | G. Friesland | Mature | 5922.00 | 230.90 | 3.88 | 300 | |
| Fairy | G. Friesland | Mature | 7683.00 | 286.95 | 3.73 | 300 | |
| Garbo | G. Friesland | Mature | 8624.00 | 278.27 | 3.23 | 300 | |
| Greta | G. Friesland | Mature | 7650.00 | 239.17 | 3.13 | 300 | |
| Hess | G. Friesland | 3 years | 5374.00 | 226.96 | 4.22 | 300 | |
| Honey | G. Friesland | Mature | 7323.00 | 250.58 | 3.41 | 300 | |
| Linda | G. Friesland | Mature | 9101.00 | 313.86 | 3.45 | 300 | |
| Maggie | G. Friesland | Mature | 9287.00 | 292.84 | 3.15 | 300 | |
| Pixie | G. Friesland | Mature | 9624.00 | 301.14 | 3.13 | 300 | |
| Sandy | G. Friesland | 3 years | 7822.00 | 237.68 | 3.04 | 300 | |
| Taffy | G. Friesland | Mature | 7593.00 | 287.96 | 3.79 | 300 | |
| Star | G. Friesland | Mature | 12808.00 | 424.89 | 3.32 | 300 | |
| Una | G. Friesland | Mature | 8821.00 | 290.76 | 3.30 | 300 | |
| Watson | G. Friesland | Mature | 10976.00 | 356.62 | 3.25 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Dolly | G. Friesland | 3 years | 7626.50 | 256.07 | 3.36 | 300 | Government Demonstration Farm. Umshandige, Fort Victoria. |
| Eunice | G. Friesland | Mature | 9984.00 | 340.17 | 3.41 | 298 | |
| Gwanda I | G. Friesland | Mature | 9696.00 | 338.97 | 3.50 | 300 | |
| Martha | G. Friesland | 3 years | 6184.00 | 231.73 | 3.75 | 300 | |
| Yvonne | G. Friesland | Mature | 10357.50 | 360.70 | 3.48 | 300 | |
| No. 56 | G. Friesland | Mature | 9429.00 | 387.70 | 4.11 | 300 | |
| No. 60 | G. Friesland | Mature | 6509.00 | 252.65 | 3.88 | 277 | |
| No. 7 | G. Friesland | Mature | 8330.50 | 286.31 | 3.44 | 278 | Grasslands Experiment Stn., Marandellas |
| No. 28 | G. Friesland | Mature | 6910.00 | 296.80 | 4.30 | 300 | |
| Bones | G. Friesland | Mature | 6288.00 | 260.18 | 4.14 | 300 | R. J. Green, Tarvie, Guinea Fowl, P.B. Gwelo. |
| Red McLean | G. Shorthorn | Mature | 6992.50 | 281.52 | 4.03 | 300 | |
| Stumps | G. Friesland | Mature | 8244.00 | 255.89 | 3.11 | 300 | |
| No. 402 | G. Guernsey | Mature | 5641.00 | 242.02 | 4.29 | 275 | |
| Corvill | G. Friesland | Mature | 8151.50 | 306.17 | 3.76 | 289 | Gwebi Govt. Farm, P.B. 76B, Salisbury. |
| Mustang | G. Friesland | Mature | 7169.50 | 232.89 | 3.25 | 274 | |
| No. 32 | G. Friesland | 4 years | 8841.00 | 322.11 | 3.64 | 288 | |
| No. 34 | G. Friesland | 4 years | 7260.50 | 251.12 | 3.46 | 300 | |
| No. 38 | G. Friesland | 3 years | 7958.50 | 256.26 | 3.22 | 300 | |
| No. 39 | G. Friesland | 3 years | 7851.00 | 246.72 | 3.14 | 253 | |
| Adye | G. Guernsey | Mature | 7717.10 | 293.35 | 3.80 | 300 | D. A. Harley, Harleyton. P.O. Beatrice. |
| Alma | G. Guernsey | Mature | 8742.80 | 350.42 | 4.01 | 300 | |
| Beauty | G. Guernsey | Mature | 6885.00 | 291.92 | 4.24 | 300 | |
| Bertha | G. Guernsey | Mature | 7121.60 | 280.87 | 3.94 | 277 | |
| Dainty | G. Guernsey | Mature | 6070.60 | 239.45 | 3.94 | 243 | |
| Dorothy | G. Guernsey | Mature | 5558.70 | 233.66 | 4.20 | 300 | |
| Flora | G. Guernsey | Mature | 6343.10 | 226.19 | 3.57 | 300 | |
| Jean | G. Guernsey | Mature | 6768.70 | 277.77 | 4.10 | 291 | |
| Joey | G. Guernsey | Mature | 5434.60 | 260.67 | 4.80 | 284 | |
| Ida | G. Guernsey | Mature | 5882.90 | 261.40 | 4.44 | 271 | |
| Lily | G. Guernsey | Mature | 5604.60 | 231.60 | 4.13 | 265 | |
| Lorna | G. Guernsey | Mature | 6512.10 | 238.53 | 3.66 | 300 | |
| Lotty | G. Guernsey | Mature | 7226.70 | 244.57 | 3.38 | 300 | |
| May | G. Guernsey | 4 years | 4863.40 | 259.06 | 5.32 | 300 | |
| Meg | G. Guernsey | 4 years | 5010.00 | 235.27 | 4.70 | 300 | |
| Minnie | G. Guernsey | Mature | 6844.80 | 242.04 | 3.54 | 300 | |

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|---|---|---|---|---|---|---|---|
| Mona | G. Guernsey | Mature | 6133.20 | 266.77 | 4.35 | 300 | D. A. Harley, Harleyton, P.O. Beatrice. P.O. Beatrice. |
| Pauline | G. Friesland | Mature | 7292.20 | 259.71 | 3.56 | 300 | |
| Primrose | G. Guernsey | Mature | 6166.40 | 278.81 | 4.52 | 258 | |
| Rita II | G. Guernsey | Mature | 7703.60 | 263.98 | 3.43 | 300 | |
| Ruby | G. Guernsey | Mature | 6860.20 | 251.12 | 3.66 | 300 | |
| Susanna | G. Guernsey | Mature | 5705.10 | 248.02 | 4.35 | 300 | |
| Sylvia | G. Guernsey | Mature | 5723.30 | 245.23 | 4.28 | 270 | |
| Victoria | G. Guernsey | Mature | 7051.00 | 300.31 | 4.26 | 300 | |
| Wendy | G. Guernsey | Mature | 5560.40 | 235.40 | 4.23 | 272 | |
| Marina | G. Guernsey | Mature | 5132.70 | 247.45 | 4.82 | 292 | |
| No. 64 | G. Friesland | Mature | 6435.00 | 272.20 | 4.23 | 278 | D. J. Huddy, Box 718, Salisbury. |
| Molly | G. Friesland | Mature | 7701.00 | 263.66 | 3.42 | 300 | |
| Phyllis | G. Friesland | Mature | 6193.00 | 272.52 | 4.40 | 297 | |
| Wendy | G. Friesland | 3 years | 6648.00 | 247.67 | 3.73 | 289 | |
| 'America | G. Friesland | Mature | 7815.90 | 273.91 | 3.50 | 300 | L. Huddy, Box 924, Salisbury. |
| Beatrice | G. Friesland | Mature | 8094.70 | 297.66 | 3.67 | 309 | |
| Edna | G. Friesland | 4 years | 5609.90 | 235.70 | 4.20 | 276 | |
| Emily | G. Friesland | Mature | 8442.60 | 293.80 | 3.48 | 284 | |
| Joyce | G. Friesland | Mature | 6577.90 | 259.46 | 3.94 | 300 | |
| Leja | G. Friesland | Mature | 8658.70 | 274.95 | 3.17 | 300 | |
| Miami | G. Friesland | Mature | 7767.10 | 263.96 | 3.39 | 300 | |
| Radio | G. Friesland | Mature | 7779.20 | 297.18 | 3.82 | 300 | |
| Tich | G. Guernsey | Mature | 6614.50 | 228.97 | 3.46 | 300 | |
| Jessie | G. Friesland | Mature | 6312.00 | 244.25 | 3.87 | 300 | Mrs. M. R. Huddy, P.O. Box 899, Salisbury |
| Jane | G. Friesland | Mature | 6019.00 | 242.36 | 4.03 | 293 | |
| J. 29/1/3 | G. Friesland | 3 years | 9106.00 | 290.27 | 3.19 | 300 | J. Jamieson, Box 217, Bulawayo. |
| J. 48/2 | G. Friesland | Mature | 11745.00 | 376.91 | 3.21 | 300 | |
| J. 45/1/4 | G. Friesland | 2 years | 8035.00 | 298.64 | 3.72 | 300 | |
| J. 56/3 | G. Friesland | 4 years | 7825.00 | 280.44 | 3.58 | 300 | |
| J. 57/1/2 | G. Friesland | 4 years | 8109.00 | 266.35 | 3.28 | 300 | |
| J. 57/2/2 | G. Friesland | 2 years | 9167.00 | 301.40 | 3.29 | 300 | |
| J. 61/1/2 | G. Friesland | 2 years | 9165.00 | 287.46 | 3.14 | 300 | |
| J. 88/5 | G. Friesland | 2 years | 10009.00 | 325.49 | 3.25 | 300 | |
| J. 94/1/1 | G. Friesland | Mature | 11219.00 | 381.59 | 3.40 | 300 | |
| J. 175/7 | G. Friesland | 2 years | 10297.00 | 340.52 | 3.31 | 300 | |
| J. 176/1/2 | G. Friesland | 2 years | 8520.00 | 281.37 | 3.30 | 300 | |
| J. 179 | G. Friesland | Mature | 11255.00 | 372.46 | 3.31 | 300 | |
| J. 179/4 | G. Friesland | 2 years | 9837.00 | 354.44 | 3.60 | 300 | |
| No. 50 | G. Friesland | Mature | 10875.00 | 414.32 | 3.81 | 300 | D. S. Kabot, Box 261, Bulawayo. |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 3 | G. Friesland | Mature | 7149.00 | 235.49 | 3.29 | 288 | R. G. Kay, Box 606, Bulawayo. |
| No. 5 | G. Friesland | 4 years | 6750.00 | 228.53 | 3.39 | 298 | |
| No. 8 | G. Friesland | Mature | 12512.00 | 384.55 | 3.07 | 300 | |
| No. 34 | G. Friesland | Mature | 7311.00 | 234.91 | 3.21 | 300 | |
| No. 10 | G. Friesland | Mature | 6558.10 | 249.65 | 3.81 | 300 | B. H. Kew, Box 972, Bulawayo. |
| No. 16 | G. Friesland | Mature | 10903.20 | 453.01 | 4.15 | 300 | |
| No. K 16 | G. Friesland | Mature | 7013.30 | 307.58 | 4.39 | 300 | |
| Dora | G. Friesland | Mature | 8201.00 | 298.03 | 3.63 | 300 | D. King, Rockwood Farm, Concession. |
| Five | G. Friesland | 3 years | 7667.00 | 276.28 | 3.60 | 300 | |
| Floss | G. Friesland | Mature | 6976.00 | 225.13 | 3.23 | 300 | |
| Johan | G. Friesland | Mature | 9010.00 | 296.65 | 3.29 | 275 | |
| Nan | G. Friesland | Mature | 9095.00 | 299.13 | 3.28 | 257 | |
| Zinnia | G. Friesland | Mature | 7884.00 | 308.51 | 3.90 | 288 | |
| Kingston Berdie | G. Friesland | Mature | 7205.00 | 269.06 | 3.60 | 300 | Kingston Farm Syndicate, Box 2, Bindura. |
| Kingston Eva II | G. Friesland | 2 years | 6145.00 | 260.93 | 4.25 | 300 | |
| Dikkop | G. Guernsey | Mature | 6853.00 | 294.08 | 4.29 | 289 | J. A. G. Kirstein, P.O. Box 199, Gwelo. |
| Josephine | G. Friesland | Mature | 7216.50 | 255.27 | 3.53 | 300 | Mrs. M. Krahner, Haydock Park, Banket. |
| No. 25 | G. Friesland | Mature | 6941.80 | 246.47 | 3.55 | 300 | H. T. Lay, P.B. 107C, Salisbury. |
| No. 44 | G. Friesland | 3 years | 7282.60 | 227.11 | 3.12 | 300 | |
| Larkhill Doris | P.B. Friesland | 3 years | 6900.00 | 263.15 | 3.81 | 300 | J. N. L. MacIlwaine, Box 23, Marandellas. |
| Edwina | G. Friesland | Mature | 5603.50 | 239.66 | 4.28 | 290 | |
| Fanny | G. Friesland | Mature | 6882.00 | 239.45 | 3.48 | 298 | |
| Olivia | G. Friesland | Mature | 6571.50 | 239.67 | 3.65 | 290 | |
| Primrose | G. Friesland | Mature | 6950.50 | 294.42 | 4.24 | 285 | |
| Sue | G. Friesland | Mature | 7217.00 | 262.20 | 3.63 | 290 | |
| Whinburn Bracken | P.B. Friesland | Mature | 8840.00 | 333.19 | 3.77 | 300 | |
| Whinburn Hornbill | P.B. Friesland | Mature | 8879.50 | 291.16 | 3.28 | 290 | |
| Witch | G. Friesland | Mature | 7735.00 | 268.28 | 3.47 | 300 | |
| Grace | G. Friesland | Mature | 7854.00 | 276.12 | 3.52 | 300 | J. MacIntyre, Box 58, Shamva. |
| Monica | G. Friesland | Mature | 6845.00 | 303.46 | 4.43 | 300 | |

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|---|---|---|---|---|---|---|---|
| No. 74 | G. Friesland | Mature | 7677.00 | 253.32 | 3.30 | 300 | J. U. McCay, P.B. J.181, Bulawayo. |
| No. 108 | G. Friesland | Mature | 7670.00 | 304.93 | 3.98 | 300 | |
| No. 152 | G. Friesland | 4 years | 6522.00 | 241.09 | 3.70 | 300 | |
| Smoke | G. Friesland | Mature | 8754.00 | 290.28 | 3.32 | 300 | |
| Thibet Park Lindberg's Heather | P.B. Friesland | 4 years | 7815.00 | 280.67 | 3.59 | 300 | |
| Bantom | G. Friesland | 2 years | 7911.70 | 297.02 | 3.75 | 300 | J. H. Maclean. Box 161, Gwelo. |
| Edith | G. Red Poll | Mature | 5709.40 | 277.89 | 4.87 | 300 | |
| Molly | G. Friesland | Mature | 8742.60 | 326.63 | 3.74 | 300 | |
| No. 53 | G. Friesland | 4 years | 5998.20 | 248.99 | 4.15 | 300 | |
| Alana | G. Friesland | Mature | 8330.00 | 327.03 | 3.93 | 300 | L. McLean. Box 161. Gwelo. |
| Annetta "V.B." | P.B. Friesland | Mature | 7732.00 | 248.28 | 3.21 | 300 | |
| Chigwire | G. Friesland | Mature | 8072.00 | 312.07 | 3.81 | 300 | |
| Eleanor | G. Friesland | 4 years | 8740.00 | 271.81 | 3.11 | 300 | |
| Felicity | G. Friesland | 4 years | 8225.50 | 305.32 | 3.71 | 300 | |
| Hilary | G. Friesland | Mature | 8872.00 | 324.93 | 3.66 | 277 | |
| Kate | G. Friesland | Mature | 9899.00 | 330.51 | 3.34 | 300 | |
| Mary | G. Friesland | Mature | 8959.00 | 327.53 | 3.66 | 300 | |
| Mitchlin Dignity C.I.A. | P.B. Friesland | Mature | 9453.50 | 336.32 | 3.56 | 300 | |
| Wanda | G. Friesland | Mature | 7620.50 | 256.67 | 3.37 | 300 | |
| Linda | G. Friesland | 4 years | 7748.60 | 264.02 | 3.41 | 300 | D. W. Marshall, Alderbury, Box 164, Umtali. |
| Ella | G. Jersey | 2 years | 5827.60 | 270.90 | 4.64 | 300 | Lt.-Col. C. I. F. Maynard, P.B. 112C, Salisbury. |
| Estelle | G. Jersey | Mature | 6414.20 | 247.55 | 3.85 | 300 | |
| Hattie | G. Jersey | Mature | 5982.00 | 262.85 | 4.39 | 300 | |
| Jabie | G. Jersey | Mature | 6274.20 | 252.86 | 4.03 | 300 | |
| Louisa | G. Jersey | 2 years | 5762.60 | 261.90 | 4.54 | 300 | |
| Striper I | G. Jersey | Mature | 7362.50 | 361.12 | 4.90 | 300 | |
| P. 8/3 | P.B. Friesland | Mature | 7289.00 | 244.62 | 3.36 | 300 | Meikles Trust & Invest. Co., Leachdale Farm, Shagani. |
| P. 14/3 | P.B. Friesland | Mature | 7717.00 | 250.18 | 3.24 | 300 | |
| P. 25/3 | P.B. Friesland | Mature | 7017.00 | 242.90 | 3.46 | 300 | |
| G. 1/5 | G. Friesland | 3 years | 7108.00 | 252.05 | 3.57 | 300 | |
| G. 3/0 | G. Friesland | Mature | 8073.00 | 294.08 | 3.64 | 300 | |
| G. 6/4 | G. Friesland | Mature | 7554.00 | 259.95 | 3.44 | 300 | |
| G. 9/2 | G. Friesland | Mature | 6583.00 | 226.79 | 3.44 | 300 | |
| G. 9/4 | G. Friesland | Mature | 7648.00 | 263.95 | 3.45 | 300 | |
| G. 10/2 | G. Friesland | Mature | 7314.00 | 258.11 | 3.53 | 300 | |
| G. 12/5 | G. Friesland | 3 years | 7131.00 | 247.36 | 3.47 | 300 | |
| G. 14/5 | G. Friesland | 4 years | 6926.00 | 234.71 | 3.39 | 300 | |
| G. 20/8 | G. Friesland | Mature | 7091.00 | 273.23 | 3.35 | 279 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| G. 28/4 | G. Friesland | Mature | 6241.00 | 234.04 | 3.75 | 300 | Meikles Trust & Invest. Co., Ltd., Leachdale Farm, Shangani. |
| G. 30/3 | G. Friesland | Mature | 7080.00 | 253.56 | 3.58 | 300 | |
| G. 56/3 | G. Friesland | Mature | 7242.00 | 234.19 | 3.22 | 300 | |
| No. 32/7 | G. Friesland | Mature | 7502.00 | 238.86 | 3.18 | 281 | |
| Doris | G. Friesland | Mature | 7849.00 | 281.00 | 3.58 | 300 | Commander E. L. Morant, Box 741. Salisbury. |
| Maisie | G. Ayrshire | Mature | 6802.00 | 237.30 | 3.49 | 300 | |
| Quality | G. Ayrshire | Mature | 6321.00 | 270.15 | 4.28 | 300 | |
| Rita | G. Friesland | Mature | 6461.00 | 231.06 | 3.57 | 300 | |
| Wren | G. Ayrshire | 3 years | 7272.90 | 295.25 | 3.92 | 295 | |
| Lucca | G. Ayrshire | Mature | 6836.00 | 235.43 | 3.45 | 300 | G. R. Morris, P.O. Box 1040, Salisbury. |
| Clare | G. Friesland | Mature | 5744.70 | 228.15 | 3.97 | 300 | J. T. Mungle, Myreside, Odzi. |
| Cherry I | G. Friesland | Mature | 7657.00 | 294.73 | 3.85 | 300 | K. Norval, Box 637, Bulawayo. |
| Chiwi | G. Friesland | Mature | 6298.00 | 241.22 | 3.80 | 274 | |
| Exwell Aafke | P.B. Friesland | 3 years | 11927.00 | 446.39 | 3.74 | 300 | |
| Exwell Aaltje II | P.B. Friesland | Mature | 8726.00 | 319.96 | 3.67 | 300 | |
| Exwell Emma | P.B. Friesland | Mature | 7909.00 | 286.09 | 3.62 | 300 | |
| Fly | G. Friesland | Mature | 8952.00 | 283.71 | 3.17 | 300 | |
| Girly | G. Friesland | Mature | 6879.00 | 245.04 | 3.56 | 286 | |
| Limpopo I | G. Friesland | Mature | 6456.00 | 237.60 | 3.68 | 300 | |
| Minhinick Terrain | P.B. Friesland | 3 years | 9238.00 | 320.74 | 3.47 | 293 | |
| Numba III | G. Friesland | Mature | 7473.00 | 295.71 | 3.96 | 300 | |
| Queenie | G. Friesland | Mature | 6662.00 | 243.39 | 3.65 | 300 | |
| Tina II | G. Friesland | Mature | 8172.00 | 295.96 | 3.62 | 287 | |
| Tombyzonke | G. Friesland | Mature | 7612.00 | 239.56 | 3.15 | 300 | |
| Turkey | G. Friesland | Mature | 8662.00 | 297.95 | 3.44 | 300 | |
| Seaborough Frances | P.B. Friesland | 2 years | 9624.00 | 362.22 | 3.76 | 300 | |
| Bell III | L.R. Shorthorn | Mature | 9053.70 | 319.86 | 3.53 | 237 | Estcourt Palmer, Ferndale, Penhalonga. |
| Biddy | G. Friesland | 3 years | 5220.70 | 230.50 | 4.41 | 271 | |
| Clarabella | G. Friesland | 2 years | 5110.40 | 239.73 | 4.69 | 268 | |
| Dolly | G. Friesland | 3 years | 6557.00 | 285.91 | 4.36 | 275 | |
| Lottie | G. Friesland | 3 years | 6524.10 | 275.58 | 4.22 | 280 | |
| Maisie II | L.R. Shorthorn | Mature | 7517.20 | 303.81 | 4.04 | 247 | |
| Maisie III | G. Friesland | 3 years | 6502.90 | 266.98 | 4.11 | 264 | |
| Nellie | L.R. Shorthorn | Mature | 6016.70 | 237.95 | 3.95 | 239 | |

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|---|---|---|---|---|---|---|---|
| Pam | G. Friesland | 3 years | 6196.00 | 277.99 | 4.49 | 280 | Estcourt Palmer, Ferndale, Penhalonga |
| Peggy III | L.R. Shorthorn | Mature | 6179.90 | 285.09 | 4.61 | 251 | |
| Petal | G. Friesland | Mature | 8263.40 | 368.28 | 4.46 | 281 | |
| Richens III | G. Friesland | 3 years | 6903.50 | 241.83 | 2.50 | 261 | |
| Simboa II | L.R. Shorthorn | Mature | 6732.90 | 263.54 | 3.91 | 249 | |
| No. 21 | G. Friesland | 3 years | 7365.90 | 313.59 | 4.26 | 280 | |
| Seven | G. Friesland | Mature | 12806.00 | 521.73 | 4.07 | 300 | Mrs. M. Parsons, P.O. Box 7, Bulawayo. |
| Temba | G. Friesland | 2 years | 9301.00 | 302.22 | 3.25 | 300 | |
| No. 2 A | G. Friesland | Mature | 6167.00 | 248.61 | 4.03 | 300 | T. C. Pascoe, Crowborough Estate, |
| No. 50 | G. Friesland | Mature | 8341.00 | 265.64 | 3.18 | 300 | |
| No. 89 | G. Friesland | Mature | 6152.00 | 233.18 | 3.79 | 300 | |
| No. 104 | G. Angus | Mature | 6239.00 | 254.87 | 4.08 | 300 | |
| Pam | G. Guernsey | 4 years | 4862.50 | 233.91 | 4.81 | 300 | H. J. Quinton, P.B. 16A, Salisbury. |
| Julia | G. Friesland | Mature | 10227.60 | 345.94 | 3.38 | 300 | Red Valley Estate, "Lushington," Marandellas. |
| Anderson | G. Friesland | 4 years | 7316.90 | 250.63 | 3.42 | 291 | G. W. Robinson, Box 346, Salisbury. |
| Black | G. Friesland | Mature | 5951.70 | 264.06 | 4.43 | 252 | |
| Marandellas | G. Friesland | 4 years | 7057.20 | 232.64 | 3.29 | 300 | |
| Topaz | G. Friesland | Mature | 6944.90 | 309.26 | 4.45 | 300 | |
| No. 22 | G. Friesland | Mature | 5346.90 | 248.21 | 4.64 | 290 | |
| Brigit | G. Friesland | Mature | 6838.20 | 233.73 | 3.42 | 300 | Mrs. D. M. Rutherford, Igava, P.O. Marandellas. |
| Luka | G. Friesland | Mature | 7160.10 | 228.61 | 3.19 | 268 | W. F. H. Scutt, Maple Leaf, Norton. |
| Paolo | G. Friesland | Mature | 9237.30 | 289.85 | 3.13 | 300 | |
| Wezulu | G. Common | Mature | 7019.80 | 264.06 | 3.76 | 300 | |
| Fanizo | G. Friesland | Mature | 6665.20 | 255.05 | 3.84 | 300 | |
| M'seku | G. Red Poll | Mature | 5633.20 | 244.65 | 4.34 | 300 | H. Stobart, Atlanta, Arcturus. |
| Bayira | G. Friesland | Mature | 6126.60 | 260.49 | 4.25 | 300 | L. Taylor, Box 55, Selukwe. |
| Victoria | G. Friesland | Mature | 8795.00 | 339.28 | 3.86 | 300 | Evelyn Tapson Trust, Ltd., "Lesape Falls," Rusape. |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Lady | G. Friesland | Mature | 7230.10 | 264.56 | 3.65 | 287 | A. W. Tennent, Kelvin, Headlands. |
| Shortone | G. Friesland | Mature | 6991.00 | 251.11 | 3.59 | 300 | |
| No. 12 | G. Friesland | Mature | 8831.50 | 281.09 | 3.18 | 300 | |
| No. 14 | G. Friesland | Mature | 6396.60 | 238.03 | 3.74 | 254 | |
| No. 34 | G. Friesland | 4 years | 7494.60 | 279.98 | 3.74 | 300 | |
| Makoni Rita III | G. Friesland | Mature | 7200.00* | 226.44 | 3.15 | 300 | P. S. Timms, "Chitora," Rusape. |
| Nurse II | G. Friesland | Mature | 6634.00 | 238.37 | 3.59 | 300 | |
| Spotty | G. Friesland | Mature | 7745.00 | 310.13 | 4.00 | 300 | |
| Vorsak | G. Friesland | Mature | 5527.20 | 241.25 | 4.36 | 269 | G. Valentine, Achnashee, Odzi. |
| Cinderella | G. Friesland | Mature | 6013.50 | 225.95 | 3.76 | 286 | Miss I. E. van Niekerk, Claremont, P.B. Inyanga. |
| Valerie | G. Friesland | Mature | 9635.00 | 307.74 | 3.19 | 300 | |
| Lovely | G. Friesland | Mature | 6063.00 | 240.38 | 3.97 | 260 | R. O. Waldschutz, Box 27, Marandellas. |
| Charity | G. Red Poll | Mature | 6369.10 | 226.43 | 3.56 | 300 | N. W. Whitehead, Lonsdale Farm, P.O. Matopos. |
| Duchess | G. Friesland | 4 years | 8414.40 | 278.24 | 3.31 | 300 | |
| Salt II | G. South Devon | 4 years | 7042.90 | 282.00 | 4.00 | 300 | |

THE RHODESIA

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# Editorial

## Notes and Comments

### EXTRACTS FROM EAST MALLING RESEARCH STATION ANNUAL REPORT FOR 1949

There are four Main Sections:

- Section I—The Experimental Farm.
- Section II—General Review of Research Work, with List of Papers published during the year.
- Section III—Research Report and Reviews.
- Section IV—Bulletin for Fruit Growers.

There had been every sign that 1949 would be a satisfactory year for top and soft fruits, but unfortunately, drought conditions later in the year upset these hopes, apples and pears being particularly hard hit; cherries and soft fruit crops, on the other hand, yielded satisfactorily.

In the case of arable crops, hay and corn were harvested successfully, but potatoes and root crops suffered from drought.

Experiments carried out on orchard soil management showed that grass swards could be beneficial for established orchards, but it seems advisable to use only autumn and winter cover for young trees. Experiments are continuing.

Various weed killers were tried out on orchards, but further tests are necessary before any definite conclusions can be drawn.

In the mineral nutrition section most attention was paid to the less severe deficiencies. The effect of the mineral content of plants on their horticultural performances is an important factor.

The second Amos Memorial Lecture: "The Soil and the Fruit Tree," by B. S. Furneaux, is published in this Report.

Interesting observations were made on the Development and Anatomy of Hop Layers. In Great Britain, hops are propagated from cuttings obtained by covering a portion of the stem with soil. This causes the stem to thicken during summer. The aerial part dies off, but the part under the soil remains alive, and this section is divided up into cuttings. For propagating, it is usual to cover stems to about 6 inches, but trials were carried out in which stems were covered with soil for several feet to produce layers.

A method of flame spectographic analysis which is mainly automatic, is described, whereby minute quantities of copper. manganese, and rubidium can be easily detected.

Analytical methods are detailed for estimating phosphorus, potassium, calcium, magnesium iron, manganese and nitrogen, where only 0.25 grms. of dry leaf is required for analyses.

Some of the insects and mites seen in 1949 are described. A new pest of cultivated pear—Pear Sawfly is discussed.

The Marketing position of fruit is reviewed, and it is pointed out how essential it is to produce good quality fruit to yield an economic price.

## RETIREMENT OF Mr. D. E. McLOUGHLIN FROM DEPARTMENT OF AGRICULTURE.

The retirement of Mr. McLoughlin, Chief Agriculturist, recently took place.

Mr. McLoughlin, who was born in the Eastern Cape, began his education there and from Potchefstroom he transferred to the service of the B.S.A. Company in 1921. He was appointed Chief Agriculturist in 1932.

He was particularly interested in maize and wheat production and was responsible for the commercial production and marketing of certified double hybrid seed maize.

We wish him many happy years of retirement.

## THE LATE Mr. ARTHUR LITTLE.

The death took place recently in Cape Town of Arthur Little, very well known for many years as the principal poultry expert in the Department of Agriculture of Southern Rhodesia and the friend and adviser of poultry keepers on farms and in towns throughout the country. For many years he worked earnestly and the prosperity of the poultry industry and the activity of his branch of the Department alike bear testimony to his efforts and to his success, which lives after him.

In first announcing his appointment in the "Rhodesia Agricultural Journal" in August, 1918, it was stated that: "It is confidently hoped that much profit and advantage may thereby result." Surely this augury has most fully been realised. In the course of his duties Mr. Little traversed the country before the days of the motor, trekking by day and often camping by night, lecturing, demonstrating, and building up this important branch of the farming industry.

Under his enthusiastic care and interest his services have notably added to the prosperity of the country. Let it be remembered that the pioneer in this good work was Arthur Little.

—(Contributed by Eric A. Nobbs, Olives, Lynedoch, C.P.)

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## ERRATUM.

In the May-June, 1950, issue, in the article on page 218, "The Dairy Industry in Southern Rhodesia," by J. R. Corry, the illustration of "Jersey Cows near Bulawayo" (Mr. S. Gilman, Bulawayo) should read "Jersey Cows near Bulawayo" (Mr. S. Gelman, Bulawayo).

# Advice to Cotton Growers

JULY, 1950.

**From the Staff of the Cotton Research Station, Gatooma.**

Cotton growers are reminded that it is necesary in terms of The Cotton Pests Prevention Act to destroy the growth of cotton plants before the first day of October, 1950. It is in the interests of all growers that this should be done for the following reason:—

By destruction of the plants the food supply of several of the major pests of the crop is also destroyed; and therefore these pests are prevented from multiplying rapidly during the first months of a new season. If the plants were not destroyed they would bear an ample food supply for the multiplication of the pests in October, November, December, etc. Such pest populations would damage severely the crop of young cotton, which is usually planted in November, and which comes into flower in January.

Growers are advised, therefore, to adopt the following practices in the destruction of cotton plants before October 1st, 1950. The earlier this is done the better.

1. Cut the plants by hoe below ground level. A number of growers mow the plants, but this may not be as satisfactory. Ploughing under the plants is not as a rule recommended, as this practice often results in many of them escaping destruction.

2. Rake the cut plants into suitable rows, and when dry, burn them. As an alternative to burning, the plants may be utilised in making compost.

3. Cross-disc the lands with a disc harrow set deeply; and leave the soil in this disturbed condition for about two weeks, if possible. This operation will reduce the number of dormant cocoons of the Sudan bollworm. From the cocoons hatch moths which commence the attack in the young cotton plants in December and January of the following season.

4. Plough the land and further prepare it for planting maize. By doing so the proven rotation benefit of cotton on the yield of the following maize crop is obtained.

5. It is important and necessary that any regrowth which may arise from persistent root systems should be destroyed immediately.

It is not advisable to allow a period of about two weeks between cross-discing and ploughing operations in light-textured soils which are subjected to wind erosion. In such cases the period between disc-harrowing and ploughing will have to be narrowed or omitted.

While it is realised that the young leafy shoots produced by the plants provide a useful "green bite" for cattle during the July to September period, it must be emphasised that the destruction of the plants should not be postponed unduly on this account. It is important that wherever practicable the lands should be disced before ploughing so that the Sudan bollworm cocoons are exposed to weathering and to the action of predators for a period of a few weeks.

In addition to the foregoing, frequent inspection should be made of all sites where cotton seed is fed to cattle and of sheds in which it is stored. Cotton Stainers—active reddish or orange coloured insects—often congregate and breed in such places. The Stainer may be killed by applications of five per cent. D.D.T. in emulsion or wettable powder form. It is advisable to protect the seed which is to be fed to catle from being treated with the D.D.T.

Finally, it must be emphasised that the destruction of the cotton plants, the cross-discing of the land, and the prevention of breeding of Stainers on cotton seed should receive the attention of ALL cotton growers. Any grower who does not heed the advice given can cause the multiplication and spread of several of the major pests of cotton over a wide area during the important early fruiting stages of the crop of a new season.

# Annual Report of the Secretary, Division of Agriculture and Lands, for the Year ended 31st December, 1949

[NOTE.—Portions of the Report of the Secretary, Department of Agriculture and Lands, have been omitted in those sections which are more fully covered in the individual reports of the Heads of the various Branches, published elsewhere in this issue.—Ed.]

## GENERAL.

The year under review has been another difficult one for the farming community. The rainfall has again been under normal and badly distributed. This erratic distribution of the rainfall materially reduced the yield of agricultural crops, stock feeds and natural veld, resulting in lower livestock production. It was necessary in consequence to introduce drought relief measures to a limited extent in certain areas of the Colony, notably the Mazoe Valley.

It is patent that water conservation has become a national problem. This is especially true in the lower rainfall areas where. with the increased intensity of agricultural production of recent years, there is a danger that these areas will become a recurrent liability to the State in years of low rainfall unless more of the run-off is held back.

**Conservation and Extension.**—This Department is now well established, and during the last two years has gained the confidence of the I.C.A. committees and farmers' organisations. The staff position in this Branch has improved, increasing from 62 to 69 during the year, but it is still 10 short of the authorised establishment. A number of the new field officers lack experience and cannot yet pull their full weight. Organised training measures, however, have been adopted which will overcome this weakness more rapidly than was originally anticipated by those responsible for the work. The new appointments include two Senior Extension Officers and four Junior Extension Officers. It is intended to expand this important activity of the Branch further.

There has been a noticeable increase in the amount of work pegged and constructed during the year.

An achievement during the year, in which the work of this Branch played a major part, has been the acceptance by the Intensive Conservation Area Committees, the Rhodesia National Farmers' Union and the Rhodesia Tobacco Association of a series of good farming principles which it is planned (with the co-operation of these bodies) to bring into general operation throughout the country.

The three demonstration farms at Chipinga, Karoi and Umshandige have made good progress during the year and are now practically in full operation. Each demonstration farm serves its particular area and is planned to encourage and lead to establishment of the type of mixed farming suited to these areas which have still large undeveloped potentials for food production.

**Gwebi College of Agriculture.**—Arrangements have been made to open the Gwebi School of Agriculture in February, 1950. The actual assembly of the staff commenced in September last. The facilities at Gwebi are good, and accommodation will be provided for a start for a total of 48 students in a two-year diploma course—24 juniors and 24 seniors. The vicinity is healthy and the Gwebi Farm affords excellent opportunities for practical work in animal and field husbandry. The farm is highly mechanised. While there are no facilities for tobacco culture at present, it may be possible to obtain these facilities on neighbouring farms. This course should meet the long-felt need for a training centre in scientific agriculture in this Colony.

**Supplies for Slaughter Cattle.**—The demand for beef is still well in excess of the supply and present indications are that this shortage will continue. The increased demand for meat is due to an increase in the European and Native population, an increase in the number of Natives employed in industry and a general increase in the consumption of meat by the African population, generally due to a rising standard of living. It is evident that other sources of protein, such as groundnuts, beans and pulse crops must be exploited to a much greater extent in the future to supplement the shortage of animal proteins. These vegetable proteins are considerably cheaper to produce than meat, though not so popular with the African.

To meet the anticipated effects of devaluation and as an inducement to farmers to produce better and heavier cattle for slaughter, the prices of slaughter stock were raised by an overall weighted percentage of approximately 13 per cent. from 1st November, 1949. To encourage producers to hold back their cattle until in proper condition for slaughter, a system of weight bonuses has also been introduced, an extra amount of 10s. per 100 lbs. cold dressed weight is being paid on cattle exceeding the following cold dressed weights in the various groups:—

| | |
|---|---|
| Rhodesia's Best | 600 lb. |
| Imperial | 600 lb. |
| "A" Grade | 550 lb. |
| G.A.Q. (oxen) | 650 lb. |
| G.A.Q. (cows) | 450 lb. |

The problem of levelling out supplies of slaughter cattle throughout the year is still unsolved. The provision of sufficient cold storage space to handle the bulk of the peak supplies in March and June will be a very expensive proposition, and if pushed to the extent commonly advocated will be uneconomic. A campaign for obtaining more cattle in the maize areas for the supply of beef from August to December was, therefore, continued during the year. A considerable increase in the number of stall-fed cattle will be necessary to overcome the seasonal fluctuations. It is hoped that the new price structure and the increased bonus paid for weight will encourage the feeding of steers in greater numbers during the dry season.

**Supplies of Pigs and Sheep.**—The pig industry is still experiencing a difficult period, essentially as a result of the relatively high cost of feeds, including maize, and the shortage of animal proteins. The interest in sheep farming remains lukewarm, despite the fact that it can form a most useful sideline on most farms.

For the time being this relatively high price of feed and the more attractive returns obtained from tobacco and cattle seem likely to discourage any rapid expansion in these two lines. Pork and mutton production must, however, increase largely when livestock production becomes more intensified.

**Hybrid Maize.**—Maize is the most important food crop in the Colony, and the plant breeding work connected with hybrid maize has been pushed during the year. Commercial double hybrid seed was put on the market for the first time in 1949, when the demand greatly exceeded the supply. The production of hybrid seed was greatly expanded during 1949, and it is anticipated that some 15,000 bags of double hybrid seed will be available during 1950, i.e., sufficient for nearly 250,000 acres. This supply may exceed the local demand until the seed is better known, and plans are being made to export a certain amount of hybrid seed.

The incentive price of 35s. per bag for maize of the 1949/50 crop, which was announced towards the end of the year, has resulted in a very considerable increase in acreage planted and with a favourable season should result in a bumper crop during 1950.

**Wheat.**—The season has been a disastrous one for wheat as the summer drought seriously affected water supplies and the moisture of retaining vleis dried up early. Some of the regular larger producers and many small growers planted no wheat under irrigation at all. There is not likely to be any major expansion in the production of wheat in the Colony until some of the larger irrigation schemes projected are in operation.

**Dairying.**—Nineteen forty-nine was in general an unfavourable season for dairying and, though the increased production of dairy products of 1948 was not quite maintained, the output in 1949, considering the season, maintains the upward trend in dairying in the Colony.

The future of the Dairy Industry has been a matter of exhaustive enquiry during the year. The prices for dairy products has been raised during the year to stimulate production and meet the effects of devaluation. The increases in prices were gazetted during the year.

There is a widespread demand, however, for some form of organised marketing for dairy products promising more stability to the industry so as to develop the confidence necessary to ensure a rapid increase in dairy production, which, under present conditions is too exacting a form of farming to be popular.

## POULTRY.

The poultry industry has passed through a difficult year. The good prices in 1947 and 1948 resulted in over-production and the eggs stored late in 1948 had to be carried over into 1949 and then could not be sold locally during the scarce season of that year at the prices fixed. This surplus will have to be exported overseas where prices are unprofitable to the local producer. It is likely now that contraction of the industry will take place during 1950. There is, however, strong agitation by producers for some statutory marketing scheme to meet the situation. Measures are under consideration to support the export of the surplus eggs just referred to pending a fuller investigation of the industry.

## TOBACCO.

Seasonal conditions were generally unfavourable for tobacco, and the quality of the Virginia flue-cured and fire-cured crops was reduced by the dry weather which occurred at critical periods of plant development. There was difficulty in obtaining sufficient native labour, especially in the case of new settlers.

It is clearly realised by all progressive growers that it is necessary to improve both the average quality of the crop and to bring down production costs before the industry will be on a sound basis to meet the competition which will arise presently. In the sellers' market of to-day, however, most producers tend very dangerously to disregard this sound outlook. It is important, therefore, that in co-operation with the Rhodesia Tobacco Association arrangements were made during the year which should result in a greatly accelerated programme on tobacco research planned to secure increased quality and yields under our conditions. It has been agreed that the Government will spend £35,000 per annum on Virginia tobacco research and the Association up to £60,000 per annum. A site for a new central Research Tobacco Station near Salisbury is being investigated now by the Tobacco Research Advisory Committee. There are some matters in regard to staff, methods of finance and administration still to be resolved, but the present co-operation is a good augury for the future. Useful progress was also made by the Tobacco Pest Control Research Scheme which has now completed a full year. Damage by insect pests and plant diseases to tobacco was light during the year.

## CHEMISTRY.

A relatively serious bottleneck is occurring owing to the shortage of chemists. The routine work of this Branch increased by 33⅓ per cent. in 1949 over the year 1948. More than 300 extra soils were submitted for analysis during the year and there has been a fourfold increase in the number of farm foods submitted. This demand shows an appreciation of the value of this type of work to the farmer. There is also a considerable backlog in soil survey work, both in connection with the irrigation projects which are under investigation and the general survey of the Colony. An increase in the staff of the Branch is now under consideration.

## DEHYDRATION.

The factory continued production during 1949, and at the end of the year showed a gross profit on sales of £1,257. Approximately 671 tons of vegetables, valued at £14,590, were supplied by 48 growers, and this raw material was converted to 54 tons of dehydrated vegetables, valued at £32,890. Sales amounted to £32,148, of which produce to the value of £7,680 was exported, mainly to Northern Rhodesia.

A new and improved costing system has been adopted and the control of consumable stores has been adapted to meet Treasury requirements.

It is considered that while the industry can continue to work satisfactorily on the present basis of production, an expansion of the activities into canning would reduce the selling prices of dehydrated products and give a necessary outlet for the potential fruit output of the Eastern Districts.

## BRANCH OF AGRICULTURAL ECONOMICS.

This Branch was strengthened during the year by the appointment of a Senior Professional Officer and two technical assistants.

The work of the economics and marketing section includes commodity costings, and economic surveys which, during the past year, included the economics of small-scale irrigation, farm labour surveys and the scope of mechanisation. Considerable data for the Engledow and the F.A.O. Reports were collected. The Registrar of Co-operative Societies during the year investigated the affairs of nearly all the registered companies and provided useful guidance to these companies.

The formulation of agricultural legislation to deal with marketing problems is an important function of the Branch. Recent pressure for marketing measures to control eggs, milk, cattle, fruit and vegetables has brought the question of a General Enabling Marketing Act to the fore. The implications of such legislation are now being studied.

Devaluation was perhaps the most important factor bearing on the agricultural economy of the Colony in 1949. The move towards the relaxation of control and the removal of subsidies which followed devaluation may profoundly affect the agricultural economy of the Colony as it is evident that freedom of control and the removal of incentive subsidies are, by nature inconsistent with a policy of self-sufficiency in basic foodstuffs. It is necessary also to take careful stock of the position so as to ensure that the price and control measures retained do not lead to an indiscriminate scramble for self-sufficiency in all foodstuffs to the detriment of secondary industry or extinguish the possibilities of future export of products which eventually will have to seek a market beyond the bounds of Southern Rhodesia.

The basic information on which to formulate a programme of self-sufficiency is lacking and it is in the collection of this information that a great part of the efforts of the Economic Branch are now being directed.

## DEPARTMENT OF FORESTRY.

(a) **Forest Act.**—One of the most important features of the Forest Act which was promulgated during 1949 is the recognition of indigenous forest as "forest" and the provision of measures for its protection.

From the earliest days in this country indigenous woodland has been largely reserved for the mining industry, subject only to certain primary reservations to the landowners for domestic and farming purposes. The Forest Act now, while it allows the miner to retain his original rights, provided the taking of timber will not lead to undue damage to the locality or shortage of timber in the Colony as a whole, does enable indigenous forest, whether in Crown or private lands, to be protected where it is managed under approved systems of forest culture. It is considered that this measure will lead to a greater and sustained production of indigenous timber in the Colony.

In other respects the Forest Act follows the general established principles for the control of forest lands in the Commonwealth and provides also for the setting aside of demarcated forest, nature reserves, the protection of particular trees, the reservation of timber resources, the regulation of the trade in Forest Produce, and for the control of prices.

(b) **National Parks Act, 1949.**—The National Parks Act passed during the year provides the organisation within the Department of Internal Affairs which, during 1950, will take over the management of National Parks and Game Reserves from the Forest Department.

The Forest Department has, during the last 20 and 15 years respectively been responsible for the control of the Wankie Game Reserve and Rhodes Inyanga Estate. While the transfer of these areas as National Parks has caused a certain departmental regret, it has been realised for some time that to secure rapid progress, it would be necessary to develop the National Parks as a separate entity with a measure of public control and separate funds.

(c) **Development.**—The total area under the administration of the Forestry Department is now 1,301,448 acres. Recommendations have been made for the reservation of further land on the Mafungabusi Plateau, West of Gatooma, for Forestry purposes. At present there is a serious shortage of plantable land for softwoods, and it has been estimated that, to ensure reasonable national security, it will be necessary for the Government to have 85,000 acres under softwood forests by 1980, in addition to private softwood forests. To meet these requirements the Government needs a further 30-35,000 acres of plantable land for which enquiries are made as the opportunity occurs.

The staff position is now more satisfactory and, by the opening of new stations, it is aimed to increase the planting programme to 2,500 acres in 1950-51 and to 3,000 acres in the following year. Shortage of labour, both the Eastern Border and at Mtao, has proved a serious limiting factor in expansion during the past year. This shortage of native labour is a matter of great concern to the industry. Efforts are being made to attract more labour by improving the working and living conditions for the natives. To a certain extent the shortages can be met by mechanisation but, unless the measures now being taken result in an increased and more efficient supply of native labour it may not be possible to implement the programme of expansion now planned.

It is notable that all conservancies report an increased interest in private forestry. In the Eastern Districts large-scale afforestations by private concerns shows good progress both in wattle culture and the growing of softwoods. A number of smaller private growers are planting trees. The policy has been to encourage strongly the development of these private plantations, wherever lands are suitable for the economic production of trees. The latest figure available shows that area of private plantations in 1948 amounted to 43,967 acres.

During the year 902 acres were planted to trees and 1,050 acres prepared for planting. The generally hot dry planting season was unfavourable, especially at the Martin and Mtao Forest Reserves. The total area of State plantations amounts now to 10,704 acres, of which 8,877 acres are soft woods.

**Commercial Aspects.**—Plans for a new sawmill at Stapleford were drawn up during the year and a pressure preservation plant to replace the existing open-tank system at Mtao is under consideration. It has been suggested that these commercial activities of the Department should be brought under the control of a Statutory Forestry Commission and proposals to this end are at present being examined.

The unaudited revenue and expenditure figures for the calendar year 1949 are: Revenue £40,546, expenditure £79,763 (including £8,244 for vermin destruction and game reserves).

The forests are still in the process of establishment and a revenue of over £100,000 is anticipated by 1955.

## DEPARTMENT OF LANDS.

This Department has had to contend with a rather difficult year. The Land Settlement Scheme was adversely affected by the unfavourable season, especially in parts of the Mazoe Valley, Hartley and Fort Victoria districts, and it was necessary to find special drought relief loans in a number of cases. The curtailment of credit through the Prescription Amendment Act of 1949 caused a number of farmers to take stock and limit their spending.

The difficulty in obtaining Field Officers and Land Inspectors is still acute, though commencing salaries for Land Inspectors have now been improved. Despite these better starting salaries, which brought in more enquiries for posts, no marked early improvement in the staff position can be expected, as the type of man suitable for the work is in keen demand in the tobacco industry which can pay better. The expanding extension service in the Department of Agriculture is, however, taking over more of the post-settlement inspection work which relieves greatly the small staff of Land Inspectors.

Attention must be drawn to the decreasing amount of useful Crown Land available for alienation. While an area of over 6,000,000 morgen is at present available, and might appear an ample reserve, little of the land is at a convenient distance to rail or suitable for even semi-intensive development. Almost all of it requires full water development. The question of allocating further land to native development has been under critical investigation during the year, but as the area of unassigned land available for allocation or exchange suitable for European occupation is very limited, not much expansion can come from this source except indirectly, by providing land to which natives now in occupation of land in European areas can be moved. The future expansion of European agriculture lies in the more intensive use of the land already occupied and not in acquiring more land from the unassigned areas.

## VETERINARY SERVICES.

**Animal Health.**—Generally speaking, the disease position in the Colony was very satisfactory at the end of 1949. There were no fresh cases of Foot and Mouth or African Coast Fever, though there was some spread of Theileriosis especially in the Lomagundi district. Drought conditions, which curtailed dipping, accounted for most of this spread. An increase in Epivaginitis has been recorded, due largely it is thought to a better recognition of the disease through experience rather than to the spread of the disease now in operation. There is more confidence now that this disease can definitely be controlled by treatment, the removal of non-breeders and the use of artificial insemination. Tickborn diseases, such as Piroplasmosis and Anaplasmosis, show an increase. Trypanosomiasis had remained stationary.

Artificial insemination which was started last year on a fair scale has not made much progress. Around Salisbury it has so far not been really successful, due to causes described fully by the Assistant Director, Veterinary Services (Research) in a separate report. Around Bulawayo, on the other hand, where Epivaginitis infection was not so extensive and breeders carried out their own insemination, results were better. The provision of trained operators to carry out insemination for farmers under local conditions is expensive, but satisfactory and economic results are reported in some dairy herds where the individual farmer collects and uses semen from his own bull. On present indications the practice of artificial insemination is not likely to expand rapidly in Southern Rhodesia in the near future unless disease conditions make it essential to resort to this method of insemination on the larger scale.

It is unsatisfactory to have to record that tick life in the Colony as a whole is on the increase. This is primarily considered to be due to the cessation of dipping in the winter. The position has been further accentuated during the last three years of low rainfall as in certain districts the cattle get so poor that dipping could not be resumed until late in December.

A further contributing factor is probably the failure of present Benzine Hexachloride dipping fluids to maintain their strength and tick killing properties under local conditions. Some farmers have been misled by the earlier good results from these dips not realising the loss of efficiency of the dip until the tick population had materially increased. At present these preparations appear to serve a useful purpose only when used in conjunction with an arsenic dip. They then give a "quick knock-down action" which deals very effectively with the first flush of ticks after the rains.

**Veterinary Research.**—There has been a very large increase in the routine and smear work carried out in the laboratory. Fortunately it has been possible to strengthen the Research staff this year. It is hoped to make progress during 1950 with the establishment of a Veterinary Research Field Station at Gwebi to the west of the railway line. Preliminary work has been planned there with Epivaginitis.

## DEPARTMENTAL REPORTS—DIVISION OF AGRICULTURE AND LANDS.

Detailed reports relating to the work performed by the Departments of Irrigation, Veterinary Services, Research and Specialist Services, Forestry, Lands and Surveyor General, have been submitted separately.

## CONCLUSION.

Shortage of staff, transport, materials and housing continue to cause difficulties and some exasperation. I have to express my appreciation of the willing co-operation and hard work of the Division under circumstances which were none too easy.

The valuable assistance of the Rhodesia National Farmers' Union, the Rhodesia Tobacco Association and the Natural Resources Board must also be acknowledged gratefully.

A. E. ROMYN,
Secretary,
Department of Agriculture and Lands.

# Summary of Annual Report of the Director of Irrigation for the Year ended 31st December, 1949

## DEPARTMENT OF IRRIGATION.

Despite a shortage of transport, much useful reconnaissance surveys and constructional work was completed by this Department during the year. A disappointing feature of the year's activities, however, has been the poor overall performance of the mechanical units. Figures submitted elsewhere by the Director of Irrigation indicate a loss of some 43 per cent. in possible working hours due to delays outside the control of his Department. In present circumstances considerable delays of various kinds must be anticipated, but the position has caused sufficient concern to justify an examination now in progress, into the whole method of disposal and control of mechanical equipment in the Service.

**Circle Activities.**—There has been a material increase in the extension activities of this Department. The number of advisory visits by Engineers has increased from 3,746 in 1948 to 5,816 in 1949. Over half of these visits were made to private applicants requiring advice on the construction of dams and weirs and small and large irrigation schemes. This demand for advice indicates a steady increase in the water conservation plans of farmers. Outstanding applications of visits to farmers total 484 at the end of the year, representing 2.2 engineering years of work and indicating the scope for further staff on this work.

**Works Completed.**—The works completed or in progress during the year in European areas include: The Upper Umgusa Dam, Geelong Dam, Tuli River Dam, Maleme River Dam, and the commencement of the lining of the main canal at Umshandige.

Preliminary work is in progress on the Hunyani Poort site. This dam will be the most important earth rockfill structure so far constructed in Southern Africa.

During the year 35 medium and large dams and weirs and four vlei dams were completed in Native Reserves. Twenty-three dams are under construction and core trenches had been put in at 35 sites by the end of the year in anticipation of the arrival of mechanical units. These dams do not include the considerable number of smaller dams built by the Land Development Officers in the Native areas under the guidance of Irrigation Engineers.

Most of the works constructed provide water supplies for stock and domestic purposes, but a number of irrigation schemes in the Native Areas are being surveyed at the same time with the belief that it will be necessary to develop irrigation on a considerable scale in these reserves if a large population is to be supported adequately.

**Water Boring.**—Water boring had again to be brought under "drought control" for the latter part of 1949. All the Department's machines were allocated for this purpose, and in addition, 15 machines belonging to private contractors were engaged by the Government. Three hundred and eighty-five boreholes were put down by the Government machines during the year with an overall percentage of 71.4 successes. The demand for boreholes, both in European and Native Areas, is quite beyond the present capacity of the drills which can be mobilised. There were 35 Government drills in operation at the end of 1949, and provision has been made to increase this number to 45 by the end of 1950. A limiting factor has been the scarcity of trained and reliable crews for the drills, and arrangements are now being made to establish a school to train drillers so as to make more trained personnel available for overtaking the backlog of work, both in European and Native Areas.

**Hydrographic Work.**—There is a general realisation now that the availability of water will be a limiting factor in determining the industrial and agricultural potential of the country. Three unfavourable rainy seasons have served to drive this point home, and emphasise the importance of the work carried out by Hydrographic Branch in measuring stream flows and the Reconnaissance Branch in the survey of possible dam sites. There has been popular demand also for the establishment of a National Water Authority to control the distribution of the water resources in the Colony. The possibilities of such an authority are under consideration.

P. H. HAVILAND,
Director of Irrigation.

# Summary of Thirtieth Annual Report of Chief Conservator of Forests for the Year ended 31st December, 1949

1. **Legislation.**—The outstanding feature of the year was the promulgation of the long-awaited Forest Act. In most respects the Act is conventional in following the recognised and well-established principles of forest laws of the Commonwealth. It provides for the setting aside of demarcated forests and nature reserves which are free from servitudes and which may not be withdrawn or alienated without the consent of Parliament; for the protection or reservation of particular trees and conservation of timber resources especially where their removal leads to spoilation of the land; for regulating the trade in forest produce; for the control of fires and the burning of vegetation.

In many respects the most important feature of the Act is the recognition of the indigenous forest as part of the land. From the earliest days the indigenous woodland has been largely reserved for the mining industry. Apart from primary reservations allowing the landowner the use of timber for domestic and farming purposes, and special reservations allowed by the Mining Commissioner, the miner had the right to take free of charge fifty per cent. of the timber from land held under Gold Belt title, and all other timber on payment of certain tariff rates from land held under non-Gold Belt title. There was thus little incentive for the owner to protect or manage the woodland on his land. On Crown land the miner had the right to take timber free of charge, even on land which had been devoted to forestry purposes by the Land Apportionment Act.

The Forest Act now safeguards Crown demarcated forests and nature reserves and any trees which are specially reserved or protected. It gives equal protection to protected private forests which are run under an approved system of management.

In other respects the miner retains his original rights, but subject to obtaining a special permit to be granted by a Mining Timber Permit Board which can refuse permits if in his opinion the taking of timber will lead to undue damage to the locality or to a shortage of timber in the Colony as a whole.

In granting permits the Board may impose conditions as to period, place, quantity and class of timber and the manner in which it shall be cut and removed.

It will be seen therefore, that the Act is not designed to deprive the miner of timber, but to control the taking in the interest of the land.

It is fair to point out that, of recent years, the use of electricity, coal and internal combustion engines has reduced the drain by miners on indigenous timber very considerably.

It is confidently expected that a further advantage of the permit system will be the collection of useful information as to the timber requirements of the mining industry.

2. **Game Reserves and National Parks.**—After twenty years of administration of game reserves, this Department is about to transfer control to the Department of Internal Affairs, which is assisted by the newly formed National Parks Advisory Board constituted by the National Parks Act, 1949.

For some years the department has advocated this change, principally because it was felt that game reserves and national parks would progress at a faster rate by being a separate entity, with a measure of public control and with its own funds which would not be confused with forestry, and partly to allow a short-staffed forest service to concentrate on its more legitimate duties.

The association has been a happy one: it could not be otherwise when the important ecological relations between animal and forest are considered, and the Department views the approaching severance with regret. This regret is tempered by the knowledge that the Department is represented on the Board and that the game in its own forest reserves still remain.

The writer feels justified in departing from established practice, and he cannot refrain from paying a warm tribute to the Senior Game Warden, Mr. E. Davison, who started the Wankie Game Reserve in 1928, and who is almost entirely responsible for the development it has reached to-day. The Colony and the National Parks Authority are fortunate in retaining the services of a man of such wide experience and intimate knowledge of and love for his work. The loyal co-operation of the Senior Game Warden and his assistants is gratefully acknowledged.

The Rhodes Inyanga Estate, with which the Department has been associated in an administrative capacity for fifteen years, came under the control of the National Parks Authority during the year by virtue of the passing of the "Rhodes Estate Inyanga Act, 1949," and of the National Parks Act already mentioned.

The portion of the Mount Silinda Forest acquired by Government last year, together with that part which is on the Gungunyana Forest Reserve, was placed under the control of a warden under this Department during the year. These two parts will be proclaimed a national park in the near future. Administration by this Department will continue for the time being and there is an understanding that the Department will retain the right to carry out certain silvicultural research on the forest from time to time.

3. **Land.**—The Forest Act gave existing forest reserves and certain areas reserved for forestry the status of demarcated forests, the details of which appear in the main body of the report. The total area under the administration of the Department for forestry purposes is now 1,301,448 acres.

It has been estimated that by 1980 Government should have 85,000 acres under softwood forests. This means that the Department will need a further 30,000 to 35,000 acres of plantable land. No land was actually acquired to this end during the year, but negotiations are proceeding.

4. **Management.**—Important progress was made in enumeration surveys. In Matabeleland completed surveys of over 220,000 acres revealed a merchantable volume of 6½ million cubic feet of mukusi, mchibi, mukwa, igonde and ishungu on certain Native Area land and forest reserve.

To safeguard the interests of certain African holders of land acquired by them in the Gwaai Purchase Area, a 100% enumeration of the merchantable timber on their farms was made and enabled them to sell to sawmillers timber to the value of £647 1s.

A determined effort was made to complete the working plan survey of all plantations at Stapleford in excess of five years of age. The calculations are almost complete, and will be of the greatest value in determining the yields available to sawmills for the next five years, in the prescription of future treatment of the stands and in giving for the first time a comprehensive picture of the total growing stock. Good progress was also made at Mtao.

It is a pity that only forest officers can appreciate fully the arduous drudgery of these surveys.

5. **Protection.**—The year has been a particularly severe one for veld fires, and it is pleasing to record that only one small fire, involving the death of 24 eucalypts, occurred in all plantations and that in the Matabeleland Conservancy where fire protection plays such an important part in the indigenous forests only 5% was traversed by fires.

The effects of the accumulation of three drought years were apparent throughout the Colony, especially during the long hot spell preceding the present summer. Severe losses of certain species were experienced at Mtao and the planting programme at Martin was again curtailed. The latter station which is only three years old has been unfortunate in encountering three successive bad planting seasons in a locality which is normally noted for its ample rainfall.

The importance of patrols, fire and general protection can be gauged from the fact that over £5,500 were spent in native labour and rations during the year.

6. **Silviculture.**—During the year 902 acres were planted and 1,050 acres prepared for planting. The total area of State plantations now amounts to 10,704 acres, of which 8,877 acres are of softwoods.

With the opening of four new stations it is anticipated that the annual planting will increase to 2,500 acres during 1950/51, and it is hoped that the annual programme of 3,000 acres will be achieved in the following year.

The Salisbury Forest Nursery was in progress of reorganisation, but it again achieved a record year with a revenue of £5,331 and dealt with 5,750 visitors. Good progress was made in preliminaries leading to new forest nurseries at Umtali, Gwelo and Bulawayo and these should be in being during 1950. Apart from the above-mentioned, which are concerned with sales to the public, nurseries were maintained at all afforestation reserves.

During the year operations covered 600 acres of blankings, 251 acres of prunings, 629 acres of thinnings and 110 acres of clear-fellings.

7. **Exploitation.**—In the Matabeleland Conservancy 1,800,000 cubic feet of mukusi and 66,810 cubic feet of mukwa were felled on forest reserves. At Stapleford 18,166 cubic feet of round timber and 43,877 cubic feet of sawn timber were disposed of, while Mtao produced 109,568 cubic feet of round timber of which 25,553 cubic feet were creosoted.

8. **Financial Results.**—The figures, unaudited, for the calendar year were Revenue £40,546 and Expenditure £79,763.

9. **Administration.**—The staff position improved during the year, although it was not possible to bring the forester staff up to strength. The approved establishment is based on the 1947 requirements, but already it is apparent that the expansion of forestry necessitates the employment of more trained men. This has been recognised and it has been approved that the Forestry School, which did such good work in training ex-Servicemen after the war, shall be re-opened on modified lines during 1950, when fourteen young men will commence a two-year course to qualify them as foresters.

The native labour position at Mtao is now experiencing a shortage and in the Eastern Districts the position is by no means secure. Considerable improvements to housing, and amenities for families and the provisioin of land for cultivation and stock are now being pursued. The writer records with pleasure his appreciation of the keenness and loyalty of all members of the Department.

10. **Private Forests.**—It is notable that all conservancies comment on the increased interest taken by the public in forestry.

During the year eight addresses were given to Farmers' Associations and other bodies. Over 95 advisory visits were made, including special visits to value forest lands or to report on tree planting projects. Much time of the staff at Head Office and conservancies was given to advisory work, both by interviews and correspondence.

Exhibits were staged as usual at the Salisbury, Bulawayo and Umtali Agricultural Shows, and for the first time at the Gwelo Show, where considerable interest was taken.

In the Eastern Districts large-scale afforestation by private concerns continued apace, both in the cultivation of black wattle and the growing of softwoods. Two large afforestation schemes were commenced in the Eastern Districts and other smaller private growers contemplate expanding their operations.

The latest figures available show that the area of private plantations in 1948 amounted to 43,967 acres.

E. J. KELLY EDWARDS,
**Chief Conservator of Forests.**

# Summary of Annual Report of the Director of Veterinary Services for the Year ended 31st December, 1949

The disease position in the Colony has been very satisfactory.

**Foot and Mouth Disease.**—All the areas under restrictions carried over from 1948 were released in February, 1949.

**African Coast Fever.**—There have been no cases in the Colony during the year. The last remaining farms in the Chipinga District were removed from quarantine in September; this was two years after the last case had been diagnosed in the District. In Beatrice District the last case recorded was in March, 1948, and the infected farm will be released in March, 1950.

**Theileriosis.**—There has been an increased spread of this disease, especially in Lomagundi District, where 11 outbreaks were recorded. Drought conditions, which interfered with regular dipping, are accountable for most of this spread, and it has been found hard to control on farms which are only lightly stocked, rendering it difficult to clean the veld of ticks.

**Epi-Vaginitis.**—Here again a considerable increase has been recorded. This has not been due to an increase in spread, but rather to the fact that an intensive inspection for the disease has been carried out during the year and a number of existing infections were found.

On a large number of farms there was no history which would have led one to suspect the presence of the disease, and reports of normal calf crops showed that it had little effect on the herds. There is little doubt that this disease had been present on a number of farms for some considerable time.

Owing to the increase in tick life other tick-borne diseases, such as Piroplasmosis and Anaplasmosis, have also increased. The position with regard to Trypanosomiasis has remained stationary.

Artificial Insemination has been used primarily as a method of coping with Epi-Vaginitis, and was used only on infected farms with the exception of a few plots and small herds in Salisbury town area.

It has met with varying success. In Bulawayo, where the number of infected farms were few and it was possible to carry out a Veterinary examination of all cows and to eliminate non-breeders, the disease has been very satisfactorily controlled, but in Salisbury area, where the number of infected farms was large, such a Veterinary examination was not possible, and all cows were inseminated when they came in season; this caused a very low conception rate.

Bulawayo cattle owners were far more enthusiastic than Salisbury about adopting insemination, and a number of the farmers have learnt the technique and are doing it themselves, and this of necessity accounts for the greater success in that District.

Their results give a very good indication that the disease can be successfully controlled in dairy herds. The problem of control in ranch cattle where Artificial Insemination is not practical is still being investigated.

As in previous years, the work of the Department both in the Field and in the Laboratory has been continually hampered by the shortage of staff and lack of efficient transport; the clerical side was also similarly handicapped.

P. D. HUSTON,
Director of Veterinary Services.

# Summary of Annual Report of Chief Animal Husbandry Officer for the Year ended 31st December, 1949

**General.**—The Colony experienced a very bad year as far as rainfall was concerned, both in quantity and distribution. This resulted in very unfavourable conditions for livestock production. Grazing was very poor and lacking, especially in quality. Many areas also experienced very serious water difficulties. Conditions were also very unfavourable for crop production and farmers were not in a position to provide the necessary supplementary foodstuffs for the dry season.

This state of affairs was aggravated by the fact that rains came very late after the dry season. A serious position prevailed at the end of the year, and heavy losses of stock were suffered on many farms.

**Cattle Industry.**—Below are given figures of the number of European-owned cattle in the Colony over the last five years.

EUROPEAN-OWNED CATTLE POPULATION.

| Year | Total |
|---|---|
| 1944 | 956,217 |
| 1945 | 1,001,269 |
| 1946 | 1,020,677 |
| 1947 | 1,036,788 |
| 1948 | 1,109,483 |

From these figures and statistics of earlier years the increase of 6.8 per cent. in European-owned livestock during 1948 was the highest since 1940. The number of cattle at the end of 1949 is not yet known, but it must be expected that the unfavourable conditions experienced during 1949 will probably have an adverse effect on the number of European-owned cattle at the end of the year.

## SUPPLIES OF SLAUGHTER STOCK.

The demand for beef is still well in excess of the supply and the present indications are that this position must be expected to continue for several years.

The following factors are essentially responsible for the increased demand for meat:—

(1) Increase in European population.

(2) Increase in native population.

(3) Increase in number of natives in employment.

(4) Increase in the consumption of meat by the African population in general.

The number of cattle slaughtered during 1948 shows a big decrease over 1947 when a considerable amount of cattle were slaughtered as a direct result of drought conditions. The decrease in the number of cattle slaughtered was counteracted to a certain extent by a considerable increase in the average cold dressed weight of all cattle slaughtered during 1948.

Figures so far available for 1949 indicate that the number of cattle slaughtered during the year will be approximately the same as those for 1948.

**Prices of Slaughter Stock.**—Prices of beef cattle delivered to the Cold Storage Commission of Southern Rhodesia were again under review during the year and the new prices given below were agreed to and became effective on 1st November, 1949.

In order to give additional incentive to farmers to produce better and heavier cattle, which is a very important factor in the drive for increased production, the bonus payable on cattle over certain weights was doubled.

**Monthly Prices per Hundred Pounds Cold Dressed Weight According to Grade.**

| Month | Rhod. Best | Imp. | A Grade | G.A.Q. | F.A.Q. | Compound | Inferior |
|---|---|---|---|---|---|---|---|
| January | 88/- | 85/- | 70/- | 66/- | 48/- | 42/- | 24/- |
| February | 76/- | 71/- | 60/- | 53/- | 46/- | 40/- | 24/- |
| March | 76/- | 66/- | 57/- | 49/- | 42/- | 36/- | 24/- |
| April | 76/- | 66/- | 54/- | 49/- | 42/- | 36/- | 24/- |
| May | 76/- | 65/- | 54/- | 49/- | 42/- | 36/- | 24/- |
| June | 76/- | 68/- | 55/- | 51/- | 43/- | 37/- | 24/- |
| July | 76/- | 71/- | 60/- | 53/- | 44/- | 39/- | 24/- |
| August | 83/- | 77/- | 61/- | 57/- | 47/- | 41/- | 24/- |
| September | 85/- | 81/- | 68/- | 60/- | 49/- | 43/- | 24/- |
| October | 88/- | 84/- | 72/- | 65/- | 49/- | 43/- | 24/- |
| November | 90/- | 86/- | 74/- | 72/- | 50/- | 44/- | 24/- |
| December | 90/- | 88/- | 74/- | 72/- | 50/- | 44/- | 24/- |

As an inducement to farmers to produce better and heavier cattle which will have the effect of considerably increasing production from present herds without increasing the age of the cattle, an extra amount of 10s. per 100 lbs. cold dressed weight will be paid on cattle exceeding the following cold dressed weights:—

| | |
|---|---|
| Rhodesia's Best | 600 lbs. |
| Imperial | 600 lbs. |
| "A" Grade | 550 lbs. |
| G.A.Q. (Oxen) | 650 lbs. |
| G.A.Q. (Cows) | 450 lbs. |

**Grading of Beef for Local Consumption.**—Grading of beef for local consumption was carried out at Salisbury, Bulawayo, Umtali, Gatooma, Fort Victoria and Gwelo.

These services were regularly inspected by the Senior Meat Grader and found to be in order. The lower grades of beef were still in relatively short supply during the year.

**Retail Prices of Beef.**—Following on the increase in the price of cattle paid to the producer, new retail prices for beef were published on 1st November, 1949.

**Cattle Buying Permits.**—The Cattle Buying Permit system was maintained during the year.

An amendment to the order was published during the year, making it necessary for farmers who were also butchers to obtain permits for all cattle purchased.

**Disposal of Cattle in Native Reserves.**—As a result of heavy destocking in previous years, cattle in native reserves came through the season reasonably well.

The grading of cattle at the Native Department weight and grade sales was regularly inspected by the Senior Meat Grader.

A big step forward was made during the year, through the appointment by the Native Department of one permanent grader.

**Fattening of Cattle.**—The campaign for fattening cattle in the maize areas was continued during the year. A considerable increase in the number of cattle to be stall-fed will be necessary before the seasonal fluctuations in supply can be overcome.

It is expected that the new price structure in force since 1st November and the increased bonus paid for weight will encourage feeding of steers in greater numbers during the dry season.

Provision of more cold storage space in addition to stall-feeding is urgently required in order to ensure a more even distribution of meat throughout the year.

**Cattle Slaughter Control Order.**—The Cattle Slaughter Control Order operated satisfactorily during the year. As a result of difficulties in certain areas in connection with the sale of breeding stock some measure of relaxation was granted in order to enable farmers to sell mature breeding stock for slaughter.

**Importation of Cattle.**—The local demand for pedigree stock and high grade dairy animals remained at a high level and the following importations of stock were made from the Union of South Africa by farmers and the Livestock Improvement Committee of the Department of Agriculture.

Pedigree stock can be imported in any number, but only a very small number of grade dairy stock can be imported from the Union.

The small quota of grade dairy stock allocated to Southern Rhodesia by the Union of South Africa is far below the country's requirements.

## REGISTERED STOCK IMPORTED FROM SOUTH AFRICA.

| Breed | Bulls | Females | Total |
|---|---|---|---|
| Afrikander | 264 | 342 | 606 |
| Friesland | 27 | 65 | 92 |
| Guernsey | 4 | 9 | 13 |
| Jersey | 19 | 60 | 79 |
| Red Poll | 6 | 5 | 11 |
| Shorthorn | 55 | 58 | 113 |
| Sussex | 14 | — | 14 |
| South Devon | 7 | — | 7 |
| Aberdeen Angus | 15 | — | 15 |
| Herefords | 88 | 17 | 105 |
| Brown Swiss | 4 | — | 4 |
| Ayrshire | 7 | 2 | 9 |
| North Devon | 11 | 4 | 15 |
| Total | 521 | 562 | 1,083 |

## GRADE STOCK IMPORTED.

| Breed | Bulls | Females | Total |
|---|---|---|---|
| Afrikander | 1 | 5 | 6 |
| Frieslands | — | 171 | 171 |
| Guernsey | — | 9 | 9 |
| Jersey | — | 97 | 97 |
| Total | 1 | 282 | 283 |

**Dairy Cattle.**—Although the production of dairy products has shown a marked improvement, demand is still in excess of supply.

Good dairy cattle are very difficult to obtain and the small quota allowed by the Union Government makes the supply of good grade dairy stock very far below the demand.

During the year an investigation into the possibilities of importing grade dairy stock from New Zealand and Australia revealed the following facts:—

Grade dairy stock of high quality is available in both Australia and New Zealand at very reasonable prices, but the cost of transporting these animals to Southern Rhodesia is very high, resulting in an estimated landed cost of £100 and £125 per head from Australia and New Zealand respectively. This compares very unfavourably with the cost of locally produced animals and importations from South Africa. Under the circumstances grade dairy stock could only be imported from these countries under heavy subsidisation, which could not be justified.

**Pig Industry.**—The pig industry is still experiencing a difficult period, essentially as a result of the high cost of feeding stuffs and the shortage of animal proteins.

Production of pig products during the year again indicated a tendency to increase. New prices for all classes of pigs became effective during the end of October, and the following prices are being paid at present:—

**Baconers:** Grade A, 1s. 4d. per lb. c.d.w.; Grade B, 1s. 2½d. per lb. c.d.w.; Grade C, 1s. 0½d. per lb. c.d.w.

**Porkers:** Grade A, 1s. 5½d. per lb. c.d.w.; Grade X, 10½d. per lb. c.d.w.

**Larders:** Grade A, 10½d. per lb. c.d.w.; Grade X, 7d. per lb. c.d.w.

Representations were made during the year by the National Pig Producers' Co-op. that bacon pigs and porkers should also be roller marked. The Pig Industry Board supported the suggestion and on their recommendation the roller marking of porkers and baconers was introduced during the year.

**Sheep.**—Interest in sheep farming still remains indifferent. Sheep can form a useful sideline on every farm and farmers have been urged to run small flocks of sheep to supply their own meat requirements and produce a few for sale. If promising results are obtained from experiments at present in progress, it may stimulate more interest in sheep farming.

## MATOPOS RESEARCH STATION.

Although the total rainfall for the period under review was slightly above average, farmers in Matabeleland sustained heavy stock losses through poverty. This may largely be ascribed to the bad distribution of the rainfall, the failing of underground water and exceptionally cold spell experienced during winter and early spring. Results obtained from our researches in beef production indicate that production under ranching conditions can be increased very considerably by improving the standard of cattle management in both Native Reserves and on European-owned farms.

**Livestock.**—As a result of the large increase in numbers of experimental cattle, the herds of pure-bred Afrikanders and Red Polls were greatly reduced. Only the best cows were retained for breeding purposes.

## RESEARCH.

1. **Cattle Breeding Experiments.**—Notwithstanding the severe drought experienced during the latter half of the year under review, the large-scale cattle breeding experiments were continued with very few losses.

From the results obtained, it was shown that under ranching conditions the genetic variations between the different breeds under observation are to a large extent obscured by the prolonged nutritional deficiencies of our winter pastures.

As sufficient data is available on the growth and development of the F.1 steers resulting from the different systems of breeding under ranching conditions, the following experiment was commenced on the 13th September, 1949, to determine the differences in the growth rates of the various breeds in question:—

Ten animals of each breed are being treated as follows:—

Group I.—On a high plane of nutrition from birth until slaughter weight (1,200 lbs. live weight) is reached.

Group II.—On a high plane of nutrition to 12 or 15 months of age, after which they are put on a low nutritional level until slaughter weight is reached.

Group III.—On a low plane of nutrition until 12 or 15 months old when they are put on full feed.

Group IV.—On a low plane of nutrition up to the age of slaughter.

Age is being used as basis in determining the level of nutrition, i.e., the steers on the high plane of nutrition are fed to reach 1,200 lbs. live weight at approximately two to two and a half years of age, whilst those on the low nutritional level are allowed to make small increases in weight so as to be ready for slaughter at between five and six years of age.

In the low-high group the animals are kept on a sub-maintenance ration to reach 300 lbs. live weight at 12 to 15 months of age. After this they are well fed.

Through these studies it will be possible to determine the following factors which are of fundamental importance in the development of a sound beef industry:—

(1) The variation in maturity between the different breeds.

(2) The type of beast best adapted to our low rainfall areas for the production of feeders under intensive farming systems.

(3) Age at which to fatten different breeds.

(4) Costs involved to fatten various breeds and crosses.

(5) Age as a factor influencing quality in beef in different breeds.

2. **Nutrition Studies.**—The investigation on the influence of the seasonal fluctuations in the nutritive values of our natural pastures on the growth and development of Hereford steers has been completed and it is anticipated that the results will be published in the near future. The studies determining the degree to which beef production is influenced adversely by the low standard of management prevailing in the Native Reserves are nearing completion.

3. **Sheep Experiments.**—The sheep experiments were continued and from the results obtained it is clear that the different breeds vary greatly in their ability to adapt themselves to local conditions.

Pneumonia appears to be a limiting factor in the breeding of pure-bred Wiltshire Horn sheep.

Studies are also being conducted to determine the variations in the breeding seasons of pure-bred Blackhead Persian and cross-bred ewes.

4. **Dairy Research.**—Favourable progress was made with the analysis of the official milk records from various producers in the Colony and the results should be ready for publication towards the end of 1950.

## MARANDELLAS RESEACH STATION.

The grade Friesland herd on Grasslands has been reduced in numbers, retaining only the best animals for future use in dairy production work. The production of this herd remained at a high level. The Shorthorn herd has also been reduced in an effort to produce more uniform animals for use in the mineral deficiency experiments.

## RESEARCH.

**Mineral Deficiency Experiment.**—This experiment is a preliminary investigation to determine the major deficiencies prevalent on granite areas in the high rainfall belt.

The indications are that more than one deficiency exists and the present set-up of the experiment will not be able to detect a combination of deficiencies. The extension of the work is limited by available land and suitable animals and will have to be undertaken over a number of years.

**Native Cattle Experiment.**—The studies on the growth and development of native cattle under different systems of management and different levels of nutrition is progressing satisfactorily, and the first groups should be ready for slaughter during the coming year.

**Different Planes of Nutrition.**—This experiment is conducted with Shorthorn steers on four different planes of nutrition. The high plane of nutrition group was slaughtered in September, 1949, at 22 months of age, giving a cold dressed weight of 63 lbs.

**Demonstrations and Visits.**—This branch again had the privilege during the year to discuss the research programme in progress with several scientists in animal production who visited the country.

Professor Waddington of Edinburgh has also taken a lively interest in the work and offered to assist in the analysis of results.

**Other Activities.**—During the year the Acting Chief Animal Husbandry Officer served on the following committees:—

Divisional Co-ordinating Committee
Livestock Improvement Committee.
Cattle Sales Permit Committee.
Pig Industry Board.

In addition, numerous visits and inspections were carried out to farms in connection with stud book registrations, livestock improvement subsidies and advisory work.

J. C. RAATH,
Acting Chief Animal Husbandry Officer.

# Summary of Annual Report of the Horticulturist for the Year ended 31st December, 1949

This has been a difficult year for the Horticulturist. Due to the drought and severe lowering of the water table, acute shortages of vegetables occurred owing to many of the larger growers' water supplies declining, which put them out of production for several months. Appeals were made to those who had water for irrigation to produce vegetables in greater quantities to offset shortages from other areas, but the great scarcity continued and shortages lasted for eleven months of the year. Prices for fresh vegetables soared to previously unheard of heights, with demands further accentuated by the large numbers of immigrants entering the Colony.

Owing to the rains commencing very late in the season, Salisbury and Bulawayo were obliged to import large quantities of poor quality vegetables from the Union during early summer.

**Climate Conditions.**—The winter was extremely mild and, except for a few ground frosts, no severe or very damaging ones were experienced. Unusually high temperatures for the time of the year occurred in spring. Deciduous fruit trees blossomed most profusely, but the heat caused many of the blossoms to dry up before they became fertilised. A few scattered hailstorms caused slight damage to young fruits, while a very severe one at Melsetter later in the year caused much havoc to apples and trees.

**Citrus.**—The declared sales of locally grown citrus, including fruit used for processing for the year 1947/48 are as follows:—

| Oranges | Lemons | Grape Fruit | Other | Total |
|---|---|---|---|---|
| 286,140 | 5,023 | 5,692 | 2,688 | 299,543 cases (75/85 lbs.) |

These figures show an overall total of approximately 76,000 cases over the previous year, and the highest production so far attained in this country.

The number of citrus trees recorded in 1947/48 was: Bearing trees, 152,718; non-bearing, 51,429; an increase of 1,900 trees over the previous year. The shortage of nursery trees continued.

One million fifty-two thousand four houndred and ninety lbs. of citrus fruit valued at £6,095 were inspected.

Three hundred and seventy thousand five hundred and ninety-one lbs. of citrus fruit from three producers valued at £1,711 were exported during the year. This represents only slightly more than half the previous year's export.

**Deciduous Fruit.**—The number of deciduous fruit trees in 1947/48 totalled 130,132. This shows an increase of 14,564 trees over the previous year. Almost half the deciduous fruit trees have not yet reached the bearing stage.

Imports of deciduous fruit for 1948 total 2,466,724 lbs., valued at £52,087, an increase of 61,758 lbs. and £1,061 in value.

**Local Fruit Supplies and Demand.**—Deciduous and berry fruit crops were on the whole poor. Regular or plentiful supplies of fruit at reasonable prices were unprocurable. Distribution needs to be considerably improved. Very much larger quantities of locally produced early plums, peaches, apples, pears and berries are needed.

Except for a few larger producers who supply distant markets and who grow, grade and pack well, too many growers still have to learn that such methods are worth while. Local fruit, unless of high standard, is almost unsaleable in competition with imported fruit.

Fruit fly attacks were very light or completely absent.

The future of the deciduous fruit industry is particularly bright, provided growers do not over-reach themselves and plant more trees than can be reasonably cared for.

**Sub-Tropical Fruit (Citrus excluded).**—Fifty-eight thousand three hundred and fifty-six sub-tropical fruit trees were recorded, an increase of 14,079.

Imports of sub-tropical fruit valued at £32,171 were made, a decrease of £927.

**Vegetables.**—Fresh vegetable imports were 1,613,422 lbs., valued at £15,531, £858 less than for 1947.

Imports of onions at 2,068,958 lbs. (value £16,383) showed a considerable increase of 634,327 lbs. over the previous year. Local production is low.

A boron deficiency of beetroots, causing arrested growth and dead sunken patches on the sides of the roots was recorded. Applications of one ounce of borax per 100 feet of row corrected the trouble.

**Tung.**—No new interest was shown by growers.

**Nurseries and Planting Material.**—Thirty nurseries were registered under the Plant Protection Act, the same as last year. Plant material valued at £15,300 was imported. Most nurserymen only handle and distribute stock imported from South African nurseries.

## RHODES INYANGA ORCHARDS.

Good progress continues to be made in bringing about a higher standard of orcharding. Following the building up of soil fertility and the introduction of improved methods of pruning, a great improvement in the performance and growth of the older trees is apparent.

**Fruit Crop and Sales.**—A very poor blossoming in 1948, followed by an extremely dry January, caused a very light crop. The total crop sold, mostly apples, but including some pears, plums, quinces and peaches was approximately 1,150 bushels (40 lbs.) Wide distribution of marketing was carried out.

## EXPERIMENTAL WORK.

**Pruning.**—What was considered good pruning pactice ten years ago has had to be abandoned in favour of individual specialised treatment to ensure that fruiting laterals are built up at any early age, and to promote and maintain annual leader growth; this particularly applies to the tip-bearing varieties.

Good results were obtained by early summer pruning of strong leader growths to get lazy buds to grow and to produce laterals. The indications show that by summer pruning, two years' growth can be obtained in one and that it is not necessary to waste the trees' energy in unnecessary production of wood instead of fruiting spurs.

Trials carried out with 25-year-old pear trees of an unsuitable variety, regrafted over to William Bon Cretien, have proved successful. Within 1½ years the trees have each yielded an average of half-bushel of pears.

Apple trees that failed to make sufficient low fruiting side branches to shade the main stems from sun scald effects have also responded to grafting back to the first branches. These trees showed renewed vigour and slight loss of crop. Such trees have had a clean start from apple mildew disease.

A series of experiments were carried out in conjunction with the Branch of Plant Pathology in disease control and the estimation of possible mineral element deficiencies.

The vigorous volunteer weed growth formed during the rains provided the main cover crop. It has been very satisfactory where constantly mown, and provided the necessary humus forming material where sufficient plant food (manure or fertiliser) was applied. Indications are that provided the soil can sustain heavy cover crops good tree growth is produced.

The East Malling Paradise apple roots stocks for trial have become well established and produced additional suckers for propagation. Type XVI is very prone to delayed foliation.

## SUB-TROPICAL EXPERIMENT STATION, UMTALI.

Staff changes held up much of the work, but good results were obtained in spite of no nurseryman being available. By the abandonment of the less accessible areas on the Portuguese border, improved running of the more intensive cropped land was possible.

Rainfall recorded for the year was 23.75 inches.

**Deciduous Fruit.**—The peach and plum crops were good, but fruit fly attacks, in spite of bait spraying, were very difficult to control. This is probably due to there being fruit of various kinds always in season and that egg laying continues throughout the year. Bird damage was very serious in spite of the employment of boys for bird scaring. As many of the apple varieties have proved unsuitable, interplanting of proved varieties was carried out.

### Sub-Tropical Fruits:

**Avocado Pears.**—Best results were obtained from the Collison variety.

**Mangoes.**—The mango crop was good, due to timely spraying with lime sulphur at 1 per cent. dilution and applied during flowering. No scorching occurred. Records of yields and flavour of the named varieties were kept.

**Pineapples.**—Owing to poor returns and small-size fruits the pineapples were planted on new land.

**Berry Crops.**—Further selections of strawberry plants from the "Salisbury" strain were made. No virus disease was apparent. It was not possible to record yields but big crops of this variety were obtained by commercial growers. The leading British variety "Auchincruive Climax" has not proved satisfactory and made little growth.

**Litchis.**—Excellent crops were obtained, the variety Rose-scented averaging 42 lbs. of fruit per tree, while the variety Mazuffepore averaged 35 lbs. per tree.

**Oyster Nuts** (*Telfairia pedata*).—Heavy crops were produced from plants grown over trees. Planted in 1946, one plant has produced 363 lbs. of nuts in 19 months since bearing commenced.

**Pecan Nuts.**—Planted in 1930 the varieties Success and Goldmine have given the most constant yields. Three trees of each variety produced a total of 20 lbs. and 15½ lbs. of dry nuts.

**Tung** (*Aleurites montana*).—The average yield from the 12 best ten-year-old trees was 135 lbs. The dried tung nut seed was sold to a Union mill for £40 per ton.

**Miscellaneous.**—Seed of Bursera (that produces Linalos oil) was imported from India and many young plants were raised. Some interest is being shown in turmeric and peppermint.

Vegetable trials, using many kinds and strains of seed were carried out.

The Concord and Isabella Grape varieties did well.

**Advisory Work.**—Judging of fruit, flowers and vegetables was carried out at nine horticultural and agricultural shows. Horticultural educational and technical exhibits were staged at the Umtali and Salisbury Agricultural Shows.

**Staff.**—An Assistant Horticulturist was appointed and assumed duty in August.

C. W. HAYTER,
Horticulturist.

# Summary of Annual Report of the Chief Pasture Research Officer for the Year ended 31st December, 1949

**Grazing Conditions.**—While the 1948/49 rainfall was generally below average and the season most unfavourable for crop production, the growth made by the veld herbage appeared to be above normal in most areas, as the unusual distribution of the rainfall apparently favoured the free seeding of the grasses. While grazing conditions during the growing season, particularly in the early part of the season were satisfactory, with the onset of the dry season, however, it soon became apparent that the feeding value of the mature veld herbage was well below normal, and cattle losses from poverty, in the sour and mixed veld areas were abnormally high. The position was aggravated by the late onset of the 1949/50 rainy season and a general shortage of water for stock. Losses of native cattle in the Reserves, although these are more heavily stocked, are reported to have been not abnormal.

The losses of European ranch cattle are reported to have been as high as 20 per cent. in certain instances (accurate figures are not yet available), and undoubtedly the beef industry received a very severe set-back.

Associated with the unusually free seeding of the veld grasses, accidental veld fires were exceptionally severe in the latter half of the year. It is realised that the control of veld fires is an expensive and difficult matter, under conditions such as we have in Rhodesia. The making of more and better fire-breaks, however, should receive far more attention than it does, as yet, on the average farm.

**Pasture Research Stations.**—Pasture investigational work is now being carried out at five stations. At three of these stations, pasture research is an important section of the activities and at two (Grassland Research Station, Marandellas, and the Archie Henderson Research Station) the Senior Pasture Research Officer is also the Officer-in-Charge of the Station. The remaining two stations are pasture sub-stations, the one at Nyamandhlovu being attached to the Matopos Station and the Melsetter sub-station to the Marandellas Station.

Plans for the development of a low-veld station to serve the arid ranching areas, where veld deterioration is becoming an increasingly serious problem, have had to be left in abeyance until the necessary increase in staff can be provided.

**Matopos Research Station.**—The main research activities in connection with the conservation and improvement of pastures in Matabeleland, and for the drier conditions in the Colony, is centred at this station. Special stress is being laid on veld investigations of which there are two main types represented on the station: "mangwe" tree veld on the granite sand formation and "thornveld" on the heavier and more fertile schist soils. Some three thousand acres of veld are in use in these experiments and the programme of work is the most comprehensive of its kind for any station in Africa. Attention is also being paid to the possibilities of establishing more productive planted pastures both under dry land conditions and under irrigation.

Points of particular interest which have already been ascertained are the rapid rate of deterioration of the veld if misused; the improvement in the grass cover and increased carrying capacity which results if the bush is thinned out and from the use of the mower; and the value of fire, if correctly used, in the control of scrub encroachment.

During the year the first 146 steers purchased for the grazing experiments were slaughtered off the veld at about 4½ years of age. They averaged 552 lbs. cold dressed weight and graded mostly Imperials and Standard A. A group of experimental steers from the Grassland Research Station, Marandellas, also off the veld and about the same age, were slaughtered in the same month and averaged 647 lbs. cold dressed weight. Although the veld at Matopos is of a "sweeter" type, the short growing season adversely affects the growth curve of cattle very appreciably.

Further extensions were made to both the irrigation and dry land grass nurseries and a number of the more promising species were established on a field scale.

Good progress was also made with development work on the station. Of special interest, perhaps, is the progress made in the installation of 12 tank lysimeters and run-off tanks to measure the run-off, soil loss and rainfall percolation under varying conditions of use of the land. No reliable information of this nature is available for Rhodesian conditions at present.

A number of very successful "Pasture Days" were held for parties of farmers from Farmers' Associations in Matabeleland and much interest was shown in the pasture work by a large number of visitors on the occasion of the Station's annual Farmers' Day.

**Grassland Research Station, Marandellas.**—The present organisation and programme of veld and pasture research work was initiated at this Station in 1945. Previously some useful experiments had been carried out in connection with the responses of the natural veld to various fertiliser treatments, as well as on the improvement of the vlei pastures. The main soil types of the station are granite sands of very low fertility, due largely to excessive leaching.

The research programme covers many phases of the main problems of the proper utilisation and management of the natural veld pasturage, and of the establishment of more productive planted pastures to supply feed of better quality and to regenerate soil fertility, following the depleting effects of annual cropping. Special attention is being paid to the improvement of the vlei pastures, which form so prominent a feature of the high lying granite country, enjoying a good rainfall.

Good progress during the year can be reported with the pasture research programme, and a number of new experiments were laid down. Planted pastures of the star grasses, from East Africa, have given the best results on dry land, in providing better quality feed and greatly increased carrying capacity, in comparison with the natural veld pasturage. In vlei land, excellent results have been obtained with the paspalum grasses, if properly fertilised. Many other promising grasses are under trial. Very marked responses have been obtained with applications of phosphatic fertilisers, heavy dressing of nitrogen and certain minor elements, including magnesium, manganese and copper. Fertiliser costs, owing to the very high price of nitrogen fertilisers, are the main difficulty. The problem is therefore essentially a question of cheap nitrogen being made available to the farmer (until such time as suitable pasture legumes can be found).

Interesting results are also being obtained from the veld experiments. The use of the mower in maintaining and improving the grass cover, and in controlling scrub regrowth on cleared land, has been amply demonstrated. Veld burning on the other hand, has been an ineffective means of controlling scrub regeneration satisfactorily in "msasa" tree veld, where thinning of the tree growth to parkland conditions greatly improves the grass cover.

A good deal of development work was also completed during the year, including building carried out departmentally, water development, fencing of experimental paddocks, tree clearing and stumping, etc.

The number of visitors to the Station again showed an increase. Successful pasture exhibits were staged at the Salisbury Agricultural Show and three of the District Shows. It is, however, gratifying to report not only an increasing interest on the part of farmers in the pasture work of the station, but also a marked extension of pasture improvement on farms, on the lines developed at the Grassland Research Station.

**Archie Henderson Research Station.**—As mentioned previously the main aim of the pasture work at this Station will be to explore the possibilities for the use of ley pastures in the cropping system. The Station is situated on the main Maize Belt, where productive ley pastures offer the most promise in maintaining soil fertility, and in improving conditions for mixed farming. A large scale grass nursery, which can be irrigated, is also being developed, not only for supplying material for experimental purposes, but also as the main source of material for I.C.A. grass nurseries and for distribution to farmers. With its fertile soil and plentitude of water, the station is ideal for this purpose.

**Nyamandhlovu Pasture Sub-station.**—This sub-station of the central station at Matopos has the distinctive soil types of the extensive areas in the north-west of the Colony, on the Kalahari and Forest Sandstone formation. The veld types are very different from these in the rest of the country, and the problems differ accordingly.

During the year rapid progress was made with development work, and in the expansion of the experimental programme. The investigations deal more particularly with the proper utilisation of the different types of veld, a difficult problem, owing to the prevalence of "umkouzaan" on certain types. Promising results are also being obtained with planted pastures of the more drought resistant grasses.

The rainfall during the past two seasons has been very much below normal, and drought killing of the indigenous perennial grasses has been widespread. Their place has been taken by less valuable species, and in certain areas annual legumes, some species of which have given rise to cases of *Crotolaria* poisoning in cattle in the district.

**Melsetter Pasture Sub-station.**—This sub-station is attached to the central station at Marandellas and is being developed to serve the high rainfall Eastern Border area, where the pasture problems are quite unique. With a comparatively well distributed rainfall, the conditions offer the most promise for establishing without the assistance of irrigation, productive dairy pastures. Due to the favourable conditions for plant growth, rapid deterioration of the natural pastures through scrub encroachment, is also a serious problem.

The experimental programme deals mainly with the development of high quality pastures in order to determine the possibilities for dairy farming in the district, and the management and correct utilisation of natural veld which cannot be ploughed owing to the steepness of the slopes and broken or rocky nature of the ground. A large nursery has been established, and over a hundred species of grasses and pasture legumes planted. Veld experiments to study the effects of burning at different times of the year in the control of scrub growth, and various systems of grazing management have been laid down. A good start has been made in building up a working herbarium of the local flora.

**Pasture Research Chemist.**—This officer, a member of the staff of the Chief Chemist, is responsible for the design, much of the work and interpretation of the data of many of the experiments being carried out at the pasture stations and particularly the Grassland Research Station.

During the year, 329 samples of plant material, soil and blood were analysed, involving 1,219 separate determinations.

**Advisory Work.**—A number of meetings of Farmers' Associations were attended, chiefly by the Chief Pasture Research Officer, and talks given on various aspects of pasture improvement.

One Pasture Research Officer stationed at Grassland Research Station was made available during the greater part of the year for pasture advisory duties with the field staff in Mashonaland of the Conservation and Extension Services.

**Native Reserves and Areas.**—Two Pasture Research Officers have been appointed for advisory assistance to the Native Department staff in connection with the reclamation and improvement of the grazing land of the Native Reserves and Areas. One officer is stationed at the Grassland Research Station, Marandellas, and the other at the Matopos Research Station.

**Grassland Survey.**—With the assistance of the field staff of the Conservation and Extension Service, a scheme for mapping of grassland types of the Colony has been started. It is hoped to complete a grassland map of the Colony during 1950.

**I.C.A. Grass Nurseries.**—The Pasture Stations have assisted with advice and in supplying planting material for the development of a grass nursery in each I.C.A. area. These nurseries should assist materially in meeting the demand for grass roots of varieties which cannot be established from seed. This demand has increased very greatly in the last few years.

**Visit to Australia.**—Arrangements have been made for a Senior Pasture Officer to visit Australia, to study pasture research and improvements methods there. Conditions in the summer rainfall areas of Australia are similar to those in Rhodesia and a great deal of research is in progress there, including extensive trials with pasture legumes obtained in the Southern Hemisphere, particularly South America.

**Standing Committee on Agricultural Production.**—The Chief Pasture Research Officer continued to act as Chairman of this inter-departmental Committee, which came into being as the result of the "Five-Year Plan," compiled by a committee of the Department of Agriculture. This short-term plan for increasing production of food crops was revised by the Standing Committee after consultation with Professor Sir Frank Engledow and Professor Leppan and later published as part of the Second Interim Report of the Development Co-ordinating Commission. Amongst many other matters dealt with by the Committee during the year was the draft report of Sir Frank on the long-term agricultural policy for Southern Rhodesia.

R. R. STAPLES,
Chief Pasture Research Officer.

# Summary of Annual Report of the Chief Tobacco Officer for the Year ended 31st December, 1949

**Seasonal Conditions.**—Seasonal conditions proved difficult throughout the Colony. The rainfall as a whole was erratic and total precipitation was well below the normal. Good rains fell during the latter half of October and the latter half of November and early December, and made it possible for most growers to plant a fair acreage to tobacco. During November-December the rainfall was fairly general and planting operations were conducted over a wide area. January was very dry and caused much anxiety, especially in the Northern areas where large numbers of ex-servicemen settlers have taken up land under the Government Land Settlement Scheme. Fortunately, however, good soaking rains fell on 29th January and continued into February and saved what had become a rather serious situation in these areas. Late planted tobacco grew well in areas where scattered showers fell over the period 9th February to mid-March followed later by heavier rains.

The quality of the Virginia flue-cured and fire-cured crops was reduced by dry weather occurring at the critical period of plant development. The planting of Turkish type tobacco was seriously curtailed because of adverse seasonal conditions coupled with the prevailing shortage of native farm labour. The shortage of native labour on farms continues to be acute and has seriously hampered the harvesting of crops. In some cases an appreciable quantity of tobacco remained unharvested—especially the Turkish type. The greatest difficulty in obtaining labour was experienced by new settlers who commenced farming operations this year. Many established farmers also had to curtail their crop programme because of the labour shortage.

There were 1818 growers of Virginia type tobacco registered under the Tobacco Marketing Act, Chapter 166, compared with 1,661 growers registered in the 1947/48 season. In terms of the Turkish Tobacco Act, 1946, there were 755 growers of Turkish tobacco registered this year compared with 1,325 growers in the previous season.

The total area planted to all types of tobacco amounted to 128,643 acres compared with 118,617 acres planted last year. The aggregate is made up of 125,968 acres flue-cured tobacco, 1,524 acres fire-cured tobacco, and 1,151 acres of Turkish. In comparison with last year the acreage under flue-cured tobacco increased by 13,363 acres and fire-cured by 298 acres, while the Turkish tobacco crop decreased by 3,499.

The yield of tobacco harvested during the season was 82,388,479 lbs. flue-cured, 850,933 lbs. fire-cured, and 367,336 lbs. Turkish tobacco, thus bringing the combined total production to 83,806,748 lbs., representing an increase of 5,889,551 lbs. over last year's crop.

**Disposal and Export of Southern Rhodesian Tobacco.**—Sales of Virginia type tobacco over the auction floors amounted to 81,716,411 lbs. flue-cured tobacco which realised £10,849,086, or an average of 31.86 pence per lb. The weight of fire-cured tobacco sold was 838,669 lbs. valued at £61,376, or an average of 17.56 pence per lb.

There was no consignment of tobacco by growers direct to overseas markets during the year.

Receipts for Virginia type tobacco therefore amounted to £10,910,462, compared with £10,185,066 received by growers for last year's crop.

The weight of Virginia tobacco exported to Priority markets was 54,153,000 lbs. flue-cured and 257,396 lbs. fire-cured, making a total of 54,410,396 lbs. despatched to these markets. The exports to Non-Priority markets were 11,321,000 lbs. flue-cured and 273,937 lbs. fire-cured tobacco. Altogether 66,005,333 lbs. of Virginia type tobacco was exported from the Colony during the year. The number of export permits issued for Virginia tobacco was 2,744 and 81 for Turkish tobacco.

In terms of the London Agreement, the Tobacco Advisory Committee notified the Southern Rhodesia Tobacco Marketing Board that the United Kingdom manufacturers were prepared to take a further 15 to 20 million lbs. over and above last year's figure of 46 million lbs. It was subsequently agreed that the British manufacturers take 56 millon lbs. from the 1949 crop and the four following crops. At the same time they stated their willingness to take more tobacco if it was available.

Later in the year two members of the Tobacco Advisory Committee visited the Colony and had several discussions with the Southern Rhodesia Tobacco Marketing Board, as the result of which the producers of flue-cured tobacco have undertaken to increase their output. Production is to be increased each year, and by 1953 the crop is expected to reach the 120 million lbs. mark.

An agreement on similar lines to the London Agreement has been entered into with Australian tobacco manufacturers.

Because of these agreements it has been necessary to continue with export control measures introduced last year to ensure delivery of the allotted quotas to priority markets. Import licences regulating United Kingdom manufacturers' purchases during 1949 were issued by the Board of Trade in Great Britain.

Export permit allocations were dealt with by a committee appointed by the Southern Rhodesia Tobacco Marketing Board.

The final allocation of flue-cured tobacco was as follows:—

| | | |
|---|---|---|
| Great Britain ...... ...... | 66.66 | per cent. of the crop. |
| Union of South Africa | 5.00 | ,, ,, ,, ,, ,, |
| Australia ...... ...... | 6.50 | ,, ,, ,, ,, ,, |
| Local Market ...... ...... | 4.00 | ,, ,, ,, ,, ,, |
| Other Priority Markets | 9.35 | ,, ,, ,, ,, ,, |
| Non-Priority Markets...... | 8.49 | ,, ,, ,, ,, ,, |
| | 100.00 | per cent. of the crop. |

According to final returns rendered after the close of the sales, the weight of tobacco purchased for these markets was as follows:—

| | | | |
|---|---|---|---|
| Great Britain ...... | 52,483,625 | = 64.23 | per cent. of total sold. |
| Union of South Africa | 4,072,215 | = 4.98 | ,, ,, ,, ,, ,, |
| Australia ...... ...... | 1,441,501 | = 5.44 | ,, ,, ,, ,, ,, |
| Local Market ...... ...... | 4,718,497 | = 5.77 | ,, ,, ,, ,, ,, |
| Other Priority Markets | 6,238,134 | = 7.63 | ,, ,, ,, ,, ,, |
| Non-Priority Markets...... | 9,762,045 | = 11.95 | ,, ,, ,, ,, ,, |
| | 81,716,017 | = 99.99 | per cent. of total sold. |

During the season some 1,686,939 lbs. of North-Western Rhodesia flue-cured tobacco was sold over the auction floors in Salisbury and realised £221,376, or an average of 31.50 pence per lb.

The Turkish tobacco crop is marketed through the Turkish Tobacco Co-operative Co., Rhodesia, Ltd., and the bulk of the crop was sold under contract to manufacturers overseas. It is estimated that the average price received by the growers was approximately 22 pence per lb. The weight of Turkish tobacco exported from the Colony amounted to 1,927,754 lbs., valued at £176,711 approximately.

Stocks of tobacco hessian remained limited, and it was necessary to continue with the rationing system introduced under the Hessian Order, G.N. No. 874 of 1947. Some 1952 permits were issued in the allocation of 487,891 yards of 54-inch by 10-ozs. hessian to tobacco growers.

**Research.**—The research activities of the Tobacco Branch have made steady progress during the year under review.

The Cigar Tobacco Experiment Station at Chipinga was opened in June and placed in charge of a Cigar Tobacco Specialist, who was appointed to the Tobacco Branch on 1st June, 1949. A preliminary inspection of land in the Mazoe Valley for the establishment of the Fire-cured Tobacco Experiment Station was also carried out during the year, and it is hoped that the station will be opened in 1950.

On the Trelawney Research Station, the research programme dealing with the following has been continued: Crop rotation, spacing trials compost and manurial trials, use of Vermiculite for seed beds and transplanting, varietal trials including two eelworm resistant varieties, tobacco nutrition experiments in the field and pot cultures, and the use of plant hormones for control of sucker growth.

The beneficial effect of grass leys on the yield and quality of tobacco has led to increased attention to the use of grass as a rotation and a number of grasses are being tested for that purpose.

During the 1948-49 season three rotational experiments came under test tobacco, namely (1) a three-year course rotation of two seasons'crops followed by one year tobacco; (2) a five-year course of three seasons' crops followed by two years tobacco; and (3) a similar rotation on a red contact sandy soil. These experiments in the main confirmed previous findings:—

(a) Best quality tobacco was obtained following grass or fallow.

(b) A legume grown immediately prior to tobacco is detrimental to quality.

(c) Application of compost following crop rotations was beneficial to the following tobacco in the three-year course rotation.

In the spacing trials previous findings were confirmed, and a spacing 3-feet 6-inches x 2-feet appears to be most suitable for the sandy soils used for tobacco. Experiments this season were carried out using three different levels of nitrogen; but increasing the nitrogen above the usual 24 lbs. per acre for the 3-feet x 3-feet spacings and given as cups per plant for the closer spacings, which therefore received considerably more per acre but the same amount per plant, did not significantly increase yields or affect quality. The season was a very dry one, however, and in a wet season a different result may well have been obtained. The dry weather also probably affected results from the field experiments with fertilisers containing increased amounts of phosphate and potash comparable to American recommendations, as no significant differences as regards yield, quality or value were obtained from any of the treatments. Pot cultures are being used in studying the nutrition of tobacco and fixing the appropriate fertiliser applications for the many different types of soil on which tobacco is grown in the Colony. In the varietal trials the outstanding varieties were C.7 (a cross between Jamaica Wrapper and Bonanza), Bonanza, and Yellow Mammoth.

Root-knot nematode experiments were intensified in order to determine accurately the effective dosage of D.D. (1.3 dichloropropene and 1-2 dichloropropane) for the control of the pest in heavily infested seed-beds. The results clearly demonstrate that a dosage of between six and eight c.c.'s per square foot is necessary.. Results of the use of D.D. in tobacco lands are, as yet, inconclusive because no heavily infested fields were available for the experiment. However, two interesting observations were made: (1) that D.D. definitely minimised the loss of plants due to insect attack; and (2) that the D.D. treatment caused more rapid and vigorous growth of the plants and consequently fertiliser applications may have to be modified in cases where D.D. is to be used in the land. Further experiments with D.D. and other soil fumigants are in progress. Investigations are continuing in the use of certain cotton varieties as a trap crop for eelworm. Trials with B.H.C. (gamma isomer of benzine hexachloride) for the control of insect attack at transplanting were continued and previous results were confirmed. White grubs and wire-worms are effectively controlled by the application of B.H.C. 0.5 per cent. applied at the rate of from 18 to 24 lbs. per acre before planting.

Disease Control experiments are conducted by a member of the Plant Pathology and Botany Branch of the Department of Agriculture residing on the station. Owing to the very dry season, the incidence of plant disease was low, although all the more common diseases were present on a small scale. Spray experiments with several types of copper fungicides were inconclusive owing to the very slight disease incidence. It was found, however, that the adhering power of Bordeaux was superior to that of any other of the sprays tested. Laboratory work included isolation of *Alternaria* from diseased tobacco material and isolations from common weeds bearing spots of the *Alternaria* type. Studies on the effect of host nutrition on the susceptibility to this disease are being continued.

Engineering Research included comparative tests with several types of coal furnaces. A new type of wood-burning furnace was designed and proved successful under test. Experiments in direct heating of barns were carried out but proved unsatisfactory owing to the generation of toxic gases and dust from the fuel. Another furnace was designed and arranged for pre-heating air for barn ventilation. A new and more efficient type of conditioning pit has been designed and drawings will be available shortly. Preliminary experiments with a heat exchanger have been made and the results are promising. It is hoped from these experiments to obtain reduced curing costs, eliminate flue pipes and effect quicker curing. Field experiments which include varietal trials, fertiliser trials, rotations, priming and spacing trials, and disease and insect control, are also conducted on the Tobacco Experiment Station at Karoi. Similar experiments with Turkish tobacco are carried out on the Turkish Tobacco and Plant Breeding Station at Umgusa, Bulawayo. Due to a succession of unfavourable circumstances the amount of valid data collected is very small in view of the number of years the station has been open. The station has now been closed. The Cigar Tobacco Experiment Station projected by the Chief Tobacco Officer a few years ago was opened at Chipinga this season. The initial development was put in hand in July, 1949, and the programme of work laid down comprises: Varietal trials with a number of seeds imported from United States of America, Canada, Sumatra, South Africa and Belgian Congo, and also several strains of locally grown tobacco. Time of planting, fertiliser trials, spacing trials, shade-grown and open plot trials, and curing and fermentation experiments. The results to date are encouraging and confirm the opinion long held by the Chief Tobacco Officer that the soil and climatic conditions in the Chipinga area are suited for cigar tobacco production.

With only one officer available for extension duties it has not been possible to fully comply with all requests for farm visits. During the year the Tobacco Officer made 542 visits to farmers, including 210 to ex-servicemen accepted under the Government Land Settlement Scheme. The Chief Tobacco Officer also visited a number of farms during the year under review and attended the Agricultural Shows held at Gatooma, Bindura, Umtali and Salisbury for the purpose of judging the tobacco exhibits. A number of Farmers' Association meetings were attended and addresses dealing with tobacco culture delivered.

D. D. BROWN,
Chief Tobacco Officer.

# Summary of Annual Report of the Dept. of Conservation and Extension for the Year ended 31st December, 1949

**Introduction.**—Eighteen months after the start of the new department, the record figure of 5,000 miles of contours pegged has been reached. Sixty-eight I. C. Areas have been declared, and a total of just on 500 dams constructed during the year.

**Policy.**– No significant change of policy occurred, but I.C.A. Committees and farmers generally are demanding more attention to farm planning and land use, and our services will have to be rapidly broadened to include all measures required to ensure maximum yields and sustained high fertility. Training of more officers to fit them for extension work must become a major part of our programme for 1950.

**Events of the Year.**—Two of the outstanding events of the year in review were the Congress of I.C.A. Committees held under the chairmanship of the Chairman of the N.R.B., and the visit to this country of Dr. Lowdermilk. The I.C.A. Congress adopted a code of 12 good farming principles and, in conjunction with the R.N.F.U. and R.T.A. and the Food Production Committee, commended them in an open letter to the farmers of Rhodesia.

Our grateful thanks are due to Dr. Lowdermilk for much valuable assistance and information.

**Extension Work.**—Only two Senior Extension Officers operated for the full year; a further two seniors and four junior extension officers were appointed towards the end of the year, but too late to accomplish much. Both Senior Extension Officers were in charge of Demonstration Farms in addition to other duties. Sixty-six meetings were attended and 441 visits made.

**Conservation Work.**—The number of visits carried out for all purposes amounted to 16,805, making an increase of 9,167 over the previous year's total, an average of 311 per officer.

**Works Pegged.**—

| | 1948 (miles) | | 1949 (miles) |
|---|---|---|---|
| Contours | 3,348 | | 5,296 |
| Drains | 164 | | 386 |
| Contour Drains | 36 | Grass Strips | 31 |

| | | |
|---|---|---|
| Pasture Furrows.. | 232 | 139 |
| Terraces | 30 | 77 |
| Irrigation Furrows | 63 | — |
| Total | 3,875 | 5,929 |

An increase of 2,054 miles.

Acreage protected: 148,225 acres, based on the figure of 25 acres per mile.

**Grand Total.—**

| | |
|---|---|
| Previously constructed | 22,306 miles. |
| Plus 1949 | 5,929 miles. |
| Total | 28,235 miles. |
| Acres previously protected | 505,090 acres. |
| Acres 1949 protected | 148,225 acres. |
| Total to 31/12/49 | 653,315 acres. |

**Works by I.C.A. Units.**—Twenty-six I.C.A. Committees operated their own equipment and carried out the following works:—

371 dams, 278 miles contours, 72 miles rebuilds, 9 miles drains, and 19 miles other works.

The combined capacity of the dams was 675 million gallons.

**Grouping I.C.A.s.**—To facilitate the allocation of units and administration generally, the following groupings of I.C.A.s was agreed upon by Committees and the N.R.B. and put into effect:—

Bulalima-Mangwe Regional Group,
Mzingwane ,, ,,
Umniati ,, ,,
Charter ,, ,,
Victoria ,, ,,
Eastern ,, ,,
Lomagundi ,, ,,
Mazoe ,, ,,
Gwaai ,, ,,
Gwelo ,, ,,
Umfuli ,, ,,
Shangani ,, ,,
Mid-Eastern ,, ,,
Upper Hunyani ,, ,,
Lower Hunyani ,, ,,
Marandellas ,, ,,

16 Groups in all, covering all declared areas.

**Conservation Works by Government Units.**—Only 14 Government units were in operation, due to much equipment being diverted for Drought Relief.

| Output | 1949 Miles | 1948 Miles | 1949 Hours | 1948 Hours |
|---|---|---|---|---|
| New Contours | 1,139 | 1,242 | 7,426 | 8,414 |
| Rebuild Contours | 89 | 180 | 447 | 884 |
| Storm Drains | 56 | 30 | 224 | 344 |
| Farm Roads | 78 | 185 | 271 | 1,146 |
| Strips | 13 | 7 | 221 | 88 |
| Dozing | — | — | 3,414 | 1,485 |
| Ripping | — | — | 1,136 | 1,080 |
| Stumping | — | — | 401 | — |
| Dams | — | — | 616 | — |
| | 1,375 | 1,644 | 14,157 | 13,441 |

Output of contours was 270 yards per hour, as against 259 for 1948.

**Chipinga Demonstration Farm.**—A dairy herd of 13 Jersey and 12 Frieslands has been started. Manager's house, stables, dairy, calf pens, dip tank, bull boxes, and implements shed have been completed; also 12 miles of fencing.

**Karoi.**—All essential buildings except the office block and pigsties are now completed.

The small Jersey herd and flock of Blackhead Persian sheep continue to do well. 200,000 bricks were made and a further 750 acres fenced.

421 visits were carried out in the area by the two Extension Officers during the year.

**Umshandige.**—The Friesland dairy herd kept in good condition despite the drought and produced from 2,126 to 3,000 gallons of milk per month. The sheep and poultry also continue to do well. Five miles of road were gravelled and a considerable amount of fencing erected. Labour was scarce and unwilling.

## GENERAL REPORT ON ALL I.C.A. AREAS.

**Climate.**—Rainfall was patchy and generally poor. Total rainfall was below normal with water supplies suffering severely. Temperatures generally above average.

**Crops.**—Planting conditions were bad in many areas, with all crops suffering more or less from lack of rain. All reports stress the need for rotations, fertilising, and better tillage methods to improve overall yields.

**Stock Feed.**—Report after report states that little or no attempt made by numerous farmers to provide winter feed for stock. Losses from poverty in many areas were as high as 20 per cent.—mostly cows and calves and young stock. The need for adequate food reserves has again been brought home to us.

**Animal Husbandry.**—Beef cattle predominate and management is excellent in individual cases, but in most, stock take the place of an unimportant sideline with little attention given to breeding, management or the provision of feed reserves.

**Veld Improvement.**—High cost of fencing, lack of watering points, are the two limiting factors to good management, causing kraaling and herding, and much tramping of the veld. Grass fires are much more prevalent in Mashonaland than in Matabeleland. A general interest is now being taken in exotic grasses for grass leys.

**Afforestation.**—This is mainly confined to the commercial plantations of the Eastern Districts and a little gum planting on tobacco farms for fuel for curing. In regard to the latter, there is an increased interest.

**Experimental Work.**—To determine the suitability of special equipment, and to arrive at the best methods of using existing equipment, a great deal of experimental work was carried out.

**Propaganda.**—Farmers' days and demonstrations, monthly newsletters, talks at Farmers' Association meetings, excursions to adjoining I.C.A.s, Young Farmers' Clubs, and many other expedients have been used by Conservation Officers and Group Officers to keep interest alive and to disseminate useful propaganda.

**General.**—The Assistant Director expresses his thanks to members of the staff and to farmers and I.C.A. Committees, the Natural Resources Board, and allied departments for assistance and co-operation during the year.

C. A. MURRAY,
Assistant Director of Research and Specialist Services.

# Summary of Annual Report of the Chief Entomologist for the Year ended 31st December, 1949

Although the incidence of insect pests showed considerable variation in Southern Rhodesia in 1949, there was no activity of such an exceptional nature or proportion that it could be classed as a national outbreak. It is true that in September there was an unusually sharp rise in the number of recorded enquiries concerning insect pests, but these did not indicate a serious outbreak of any kind.

On the other hand, early in the year, rodents reached outbreak proportions in several widely separated areas, a development which was foreshadowed, but not forecast, in my report for 1948, in which they were recorded as digging out the planted seeds of maize and citrus towards the end of the year.

**Locusts.**—There has been neither record nor rumour of the presence of any stage of the Red Locust, *Nomadacris septemfasciata*, Serv., in the Colony. The International Convention for the Permanent Control of Outbreak Areas of the Red Locust was formally signed in London on 22nd February, 1949, on behalf of Belgium, the United Kingdom, the Union of South Africa, and Southern Rhodesia. The Convention provides for the formal continuance, for not less than ten years, of the International Red Locust Control Service, an organisation which has operated on a less formal basis from Abercorn, Northern Rhodesia, for several years with encouraging success.

There are no immediate prospects of an invasion into the Colony of Red Locusts, nor is an invasion in the 1950-51 growing season foreshadowed.

The African Migratory Locust, *Locusta migratoria migratoriodes*, Rcn. & Frm., is economically less important in Southern Rhodesia than is the Red Locust. An African Migratory Locust Convention similar to that relating to the Red Locust is in course of negotiation. Meanwhile, a provisional organisation exists.

**Army Worm.**—Although no reports of the presence of Army Worm, *Laphygma exempta*, Wlk., were received in 1949, reports early in 1950 indicated that some hatchings had occurred late in December.

**Pests of Cereals and Grasses.**—Among insect pests of maize, the incidence of the Maize Stalk Borer, *Busseola fusca*, Hmp., was rather above normal. In a test demonstrating and confirming the effectiveness of late maize planted in mid-January as a trap to attract the second generation of egg-laying moths, a heavy infestation by half-grown second generation caterpillars was found in the trap, as was expected, in March. The trap crop appeared to afford the earlier-planted main crop good protection. Before the caterpillars in the trap crop could mature, the plants were cut and ensiled. It can be recorded with satisfaction that there were several enquiries in advance regarding precautions to be taken against the Maize Stalk Borer. Normally few, if any, enquiries are made before precautionary measures against the first generation are too late.

Grubs of the snout-beetle, *Dereodus recticollis*, Mshll., did considerable damage by boring in young maize plants in November, 1948, on a farm in the comparatively dry area north-west of Bulawayo. The adults emerged in January, 1949. A similar infestation by grubs was reported from the same general locality in December, in early planted maize. It is thought that somewhat later plantings, as normally advised against the first generation of Maize Stalk Borer, may effect avoidance of the pest. Our previous record of this insect refers to defoliation of young peach trees by the adults in the Bulawayo area in March, 1929.

Cutworms, *Euxoa segetis*, Schiff., reduced the stands on two large trial plots of maize on the Gwebi Experimental Farm in December. Infestation must have commenced before planting. In the series, these plots were the only two which had received extra humus, in one case a green crop still partly undecayed, and in the other, compost. Available information leaves room for doubt whether there had been weed growth to attract egg-laying moths before planting, or whether the added humus was directly responsible for egg-laying.

Very numerous adults of the Cetoniid fruit beetle, *Pachnoda rufa*, de Geer, were reported to be attacking the grain along its whole length in maize ears in Melsetter during February. It is not certain whether they initiate attack or are first attracted to openings made by weaver birds (Ploceidae) at the tips of the ears.

Reports of mammalian pests included spring hares, *Pedetes*, destroying young maize plants, baboons making away with ears of maize, and field mice, *Mastomys coucha microdon*, Peters., attacking the ripening and ripened ears of kaffir corn and maize standing in the field. The reports of field mice came from several widely separated districts. In Nyamandhlovu as many as 85 individuals were reported to have been dug from one burrow in maize lands. Even if several burrows were concerned, the report at least indicates a dense concentration. In the Sabi Valley, Africans described the activities of these rodents among the dried but still erect kaffir corn plants as sounding like elephants feeding among the crops. Reports continued from May until August, after which the last crops had probably been eaten or reaped.

*Paromius*, a species of the Lygaeid family of sucking bugs, attacked the ears of native grown cereals in the Gutu District in April. It had also been recorded on millet in January, but in the April outbreak its damage to rapoko (*Eleusine corocana*) was estimated by Native Department officials as high as 75 per cent. Heads of grain were poorly filled. Rice was less attacked but affected ears were "blind." Munga (*Pennisetum spicatum*), on which it was also present, was apparently not affected.

Seed dressings of coal tar emulsion have been advised and used successfully for some years against insects attacking maize seed in the soil either before or after germination. In current experiments coal tar emulsions are being compared with dressings of BHC and DDT. Insect damage has been slight in all plots, including untreated controls, but the tests so far indicate at least that germination and early growth are not seriously affected by any of the treatments, apart from slight delay in germination caused, as previously, by the coal tar emulsions.

**Leguminous Crops.**—Apart from attack by such general pests as cutworms and eelworm (*Heterodera marioni*, Goodey), legumes are at present not the subject of many regular specific pests of a serious nature, though sporadic pests may sometimes cause very considerable damage. The sunn hemp beetles, *Exora discoidalis*, Jac., and *E. apicipenne*, Jac., which are regular serious pests of sunn hemp planted in November or most of December, were not reported in 1949. This is believed to be accounted for partly by the substitution of other green manure crops and partly by planting sunn hemp not much earlier than the turn of the year.

**Solanaceous Crops.**—Tobacco Leaf Miner, *Gnorimoschema operculella*, Zell., and to a greater extent Tobacco Stem Borer, *G. heliopa*, Lowr., were prominent among pests damaging growing tobacco from January to April. In most cases the initial infestation by the Stem Borer was, by inference, traceable to the seedbeds. The high price and comparative scarcity of seed-bed cloth, coupled with a reluctance on the part of many growers to use this protection on seed-beds or to include insecticides in their sprays, led to infestation of young plants in the beds and transfer of this infestation to the lands on planting out. The seed-bed infestation was probably due to failure to destroy the remains of the previous tobacco crop by mid-winter. Very heavy loss was sustained on some farms, where well grown tobacco was breaking off a few inches above soil level, the stems having been weakened at this point by the borers.

Severe attacks by Tobacco Budworm (American Bollworm), *Heliothis armigera*, Hubn., on tobacco seed heads in the field which had been bagged for seed-collecting were reported. Sufficient inspection for this pest prior to bagging as well as in subsequent routine inspections had apparently not been made. Infestation in the bags by Tobacco Aphis, *Myzus persicae*, Sulz., was also severe.

The blue blister beetles, *Cyanolytta pectoralis*, Gerst., and *C. subcoriacea*, Muls., were very numerous in the Hartley district during October and November, where in some cases they destroyed very young tobacco seedlings. They were also found to be feeding in large numbers on pigweed (*Amaranthus* sp.)

The large sand cricket, *Brachytrypes membranaceus*, Dr., damaged many young tobacco plants in the field in November. In some lands, control by introducing baits or fumigants into their burrows was impracticable because of the looseness of the dry sandy soil. Recourse was had to digging out the insects.

Experimental helicopter spraying of tobacco plants with parathion and other sprays by a commercial pest control organisation was officially observed. Further work needs to be done on the distribution and direction of the spray on tobacco plants.

**Cruciferous Crops.**—The Cabbage Webworm, *Hellula undalis*, F., was responsible for the deformation or destruction of cabbages in November by boring into the stems. When damage is observed it is usually too late for control in the affected plants, which should be safely disposed of. The application of stomach poisons to the young plants is a useful precaution.

The incidence of Bagrada Bug, *Bagrada hilaris*, Burm., was noticeably sub-normal.

**Cucurbitaceous Crops.**—Pests of cucurbits, although present and limiting production (e.g., the Melon Flies, *Dacus*, spp.), showed no unusual activity.

**Cotton.**—Damage by insect pests of cotton, according to a progress report prepared by Messrs. A. H. McKinstry and R. James, of the Cotton Research and Industry Board's Research Station at Gatooma, was the lightest on record for many years, and the Colony's average acre-yield of seed cotton was above the normal. Tests with DDT and BHC against insect pests of cotton on the Station were inconclusive, possibly owing to the low incidence of pests.

**Fruit.**—Among fruit attacked by fruit fly, unusually late-ripening paw-paws (*Corica papaya*) were recorded as a host of *Pterandrus rosa*, Karsch., in March, by which time a dense population of these flies has usually been built up on other host fruits. In the same month, granadilla fruits were attacked by an undetermined species of fruit fly, but in no case in this fruit was the insect found to have developed far. Usually the fleshy layer beneath the skin of the fruit had isolated the damaged part by forming a cyst around it.

Young Mexican apple trees (*Casimiroa edulis*) are usually a favoured host of Soft Scale, *Lecanium hesperidum*, L. Infestation on a young tree at Glendale was noted to have been very considerably reduced by the predatory caterpillars of the Noctuid moth, *Eublemma costimacula*, Saalm., in November. Most of the mature caterpillars descended the trunk, typically having attached to their bodies the exuviae of the scale insects, which later formed part of the pupal cases. These were made near the base within the protection afforded by trash. The predators were heavily parasitised by Hymenoptera. Other scale insects included Red Scale, *Aonidiella aurantii*, Mask., on citrus and heavy infestation by *Tachardina* on various individual trees of custard-apple and pecan nuts.

There was only one report of Woolly Aphis, *Eriosoma lanigerum*, Hausm., which was found on apple trees near Salisbury in January. Grubs of the Cetoniid fruit beetle, *Pachnoda impressa*, Gold., were found to be exceedingly numerous in the soil of an Eastern Border garden, but damage by them was not specifically reported. The Nitidulid beetle, *Lasiodactylus iniquinatus*, Erich., was accused of primary damage to the fruits of litchi in the field, though it is suspected that the damage was secondary.

Reports of attack by the Capsid bug, *Helopeltis sanguineus*, Pop., were confined to a few referring to guava and mango. Damage to fruit by this insect became widespread and frequent a few years ago, but has since subsided, suggesting a cycle. As the insect is little known and the damage, especially to guavas, is obvious and destructive, it would be expected that more enquiries would be received were the pest relatively abundant.

Attack by caterpillars of the False Codling Moth, *Argyroploce leucotreta*, Meyr., on sub-tropical fruits was almost negligible.

According to Dr. A. A. Morris, Chemist and Chief Technical Officer at the British South Africa Company's Mazoe Citrus Estate, citrus pests were of little economic importance on the estate, with the exception of Citrus Thrips, *Scirtothrips aurantii*, Faure, which developed with moderate severity in localised areas.

**Forest and Shade Trees.**—Ornamental *Pinus radiata*, *Cupressus* sp., and Norfolk Island Pine (*Araucaria excelsa*) were heavily attacked by the Araucaria Scale, *Erinococcus araucariae*, Mask., in various localities.

Cocoons of the Lasiocampid, *Pseudometa dollmani*, Tams, were found in thousands in wattle plantations on the Eastern Border. Many of them were parasitised by ichneumon and braconid wasps, and tachinid flies. The caterpillars have previously been reported as feeding on msasa (*Brachystegia spiciformis*).

The cutworm, *Euxoa segetis*, Schiff., destroyed large numbers of six-weeks-old *Cupressus torulosa* in a nursery in Salisbury. The Eucalyptus Borer, *Phoracantha semipunctata*, F., was reported on several occasions to have damaged eucalyptus logs and, in each case, it was shown that the bark had not been removed at the time of felling.

Unidentified bagworm caterpillars (Psychidae) damaged ornamental flamboyant trees (*Poinciana regia*) growing in Umtali streets. Nearby *Jacaranda* and *Spathodea* were not attacked. Attempts to rear adult specimens failed. The cotton stainer, *Dysdercus intermedius*, Dist., and *D. nigrofasciatus*, Stal., were reported in large numbers on ornamental Australian Flame Trees (*Sterculia acerifolia*) in the Mazoe District.

**Miscellaneous Crop and Garden Plants.**—A severe localised outbreak of a new species of mint flea-beetle, *Longitarsus menthobius*, Bryant, occurred in a crop of experimental mint (*Mentha piperita*) on a farm in the Mazoe District in November. It was at first feared to be a recent importation, but the discovery of typically damaged wild mint (*M. longifolia*) in other areas allayed these fears somewhat.

Some gladiolus and ifafa lily corms were severely infested in the field by the mite, *Rhizoglyphus echinopus*, F. & R., but the infestation appeared to be secondary to physical injury in all three cases.

*Dorylus* ants were reported from four centres damaging or destroying artificially watered annuals by attacking the root surfaces. Carrots suffered the most severely but cabbages, lupin and petunia were also badly affected. The liquid application of benzene hexachloride, which was allowed to soak into the soil, kept the ants away from such plants as petunias but could not be advised for carrots owing to the danger of tainting. Incidentally and more typically, it may be added that these normally carnivorous ants killed about a dozen especially valuable turkey chicks reared from imported eggs.

Tea plantations on the Eastern Border suffered heavily from the attacks of termites on the living plants. *Odontotermes transvaalensis*, Sjost., or a near relation, is inculpated. Cultivation has unfortunately eliminated surface signs of nest sites. The only successful method so far adopted against these pests is the application of a layer of veld grass to serve as a counter-attractant was well as a mulch.

Several grasshoppers (Orthoptera) have been reported as doing damage, not always severe, to various cultivated plants, especially tobacco. The most frequently occurring of these have been *Catantops melanostictus*, Sch., and *Zonocerus elegans*, Thb. Two other species which commonly occur semi-gregariously, *Phymateus viridipes*, St., and *Maphyteus baccatus*, St., have not been reported during the year.

**Stored Products, Timber, etc.**—The practice of storing maize in tobacco storerooms led to several complaints of the presence of the Maize Weevil, *Calandra oryzae*, L., and flour beetles, *Tribolium*, spp., in bales of tobacco arriving on the auction floors. The owner was communicatefl with in each case reported, and the position corrected. Infestation of stored maize by the Maize Weevil was heavier than usual and the added pressure from this source, combined with earlier opportunities for field infestation afforded by early ripening of the crop, brought about increased incidence of the weevil in the field at harvesting.

Apart from infesting held-over tobacco on several farm and warehouse premises, the Stored Tobacco Beetle, *Lasioderma serricorne*, F., damaged herbarium specimens in Salisbury, the families mainly attacked being Malvaceae, Capparidaceae, and Convolvulaceae in that order of severity.

The Curculionid, *Acallopistus fallax*, Boh., was reared from seeds of *Abutilon angulatum*.

Experimental consignments of angelica root were found on arrival overseas to be infested by the Indian Meal Moth, *Plodia interpunctella*, Hbn., which was able to infest the roots before they were packed.

Caterpillars of the Noctuid Moth, *Simplicia inflexalis*, Guen., attacked newly bulked air-cured tobacco. Damage was negligible. The normal food of this species is believed to be dead or dying grass and weeds.

**Miscellaneous Insect Notes.**—In November, before the commencement of the rains, the tree, *Heeria reticulata* (Anacardiaceae) was the host of nymphs of the Cercopid bug, *Ptyelus grossus*, St., in a "rain-tree" combination. "Precipitation" was copious, two-pints of water having been collected in a small basin overnight.

Beetles believed to be *Lagria villosa* were reported as being very numerous on angelica plants in August, though no noticeable damage was done.

*Piezodorus purus*, Stal., a shield bug, invaded a house in plague proportions in Gwelo.

Reports of piercing insects not normally seeking out man for their attentions included the Tabanid fly *Nuceria pallidipennis*, Ric., the assassin bug, *Pirates conspurcatus*, Dist., and a Nepid or Water Scorpion, *Ranatra*, sp., a specimen of each of which inflicted a painful bite on man.

A few examples of suspected button spiders, *Latrodectus indistinctus*, Lat., were sent in for identification. These proved to belong to the allied species *L. geometricus*, Koch., which is relatively harmless. The latter is more frequently found in habitations and possesses a characteristic crimson hour-glass shaped mark on the underside of the abdomen.

**Tsetse Fly Operations.**—Game reduction operations against *Glossina morsitans*, and clearing operations against this species, *G. brevipalpis* and *G. pallidipes* on our eastern border have continued satisfactorily.

The prolonged and intense dry season, following on indifferent rains, may have been responsible for a rather wider scattering of *G. morsitans* in certain areas towards the end of the dry season than is normally expected. On the other hand it remains to be seen whether a cyclical increase of tsetse such as has been suggested elsewhere has commenced.

A separate report on the Tsetse Fly position will be published.

**Administration.** There was an increase in the number of packages and consignments of imported plants, fruit, etc., inspected at the ports of entry. Owing to the presence of pests or absence of required certificates, over 2,000 packages of fruit, tomatoes and potatoes were returned to the Union of South Africa. The importation of *Opuntia*, including spineless cactus, from the Union was prohibited to avoid importing introduced insect enemies of these plants. Severe restrictions were placed administratively on the importation of tomato fruits and seeds from that country on account of the reported presence there of Bacterial Canker of Tomato (*Corynebacterium michiganense*).

The number of nurseries registered remained unchanged at 30.

Tobacco removal licences issued for 1950 remained about the same at 2,460 and the number of inspections increased from 142 to 644. Five licences were temporarily suspended owing to the discovery of the Stored Tobacco Beetle, *Lasioderma serricorne*, F. Failure to destroy tobacco seed-bed plants was the commonest serious offence on the part of growers.

**The Insect Collection.**—About 100 species were identified for the Branch by the Imperial Institute of Entomology and smaller numbers by organisations or individual workers in the Union.

**General.**—Recorded enquiries regarding pests increased by 34 per cent. to 441, and many more were unrecorded. Bee-keeping enquiries remained higher than formerly, and the formation of a Rhodesian Bee-keepers' Association, which had been quietly commended by the writer to interested parties of recent years, took place in July. Only one lecture was given. Seven signed articles were published. One international conference and 21 established board and committee meetings were attended.

The staff position remains difficult.

**Acknowledgments.**—I wish to acknowledge the helpful co-operation of the Customs Department in connection with Plant Import Regulations, the B.S.A. Police in connection with Tobacco Pest Prevention Regulations and miscellaneous help, the Native Affairs Department and the Veterinary Department in connection with Tsetse Fly Control Operations, the staff of the Mt. Silinda Mission Hospital for sympathetic treatment of native labourers injured in the maintenance of the anti-tsetse forest clearing on the eastern border, and the Salisbury Branch of the Southern Rhodesia Red Cross Society for assistance in keeping our lonely tsetse fly posts supplied with reading matter.

I also tender my grateful thanks to all members of my staff for their loyal service and the full and willing co-operation they have shown throughout the year.

M. C. MOSSOP,
Chief Entomologist.

# Summary of Annual Report of Chief Agricultural Economist for the Year ended 31st December, 1949

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The most important factor bearing on the agricultural economy of the Colony in 1949 was Government action as a result of devaluation. A poor cropping season, resulting in heavy maize imports for the second time in three years, followed by a prolonged dry season involving severe cattle losses and accentuating the seasonal shortages of meat, milk and butter, had strengthened the body of opinion in favour of self-sufficiency in basic foods. Devaluation meant a considerable increase in cost of any food imports from dollar sources and in the face of the growing burden of the cost of subsidies the Government took immediate steps towards greater freedom in the national economy, removing the heavy maize subsidy and partially relinquishing price control.

The Government move towards relaxation of control brought major problems into immediate focus. In the first place it had to be recognised that freedom from control in agriculture would be inconsistent with a policy of self-sufficiency in basic foods. Soundly based expansion in food production must rest on stabilised prices and it is only by controls that prices can be stabilised and expansion fostered in those directions and at the rate most advantageous to both the agricultural and national economy. Again, with the removal of the maize subsidy it became clear that any indiscriminate scramble towards self-sufficiency without due regard to cost may place a rigid restriction on the future of the agricultural industry. This aspect has been stressed by the factors responsible for the collapse of the egg market. Paying the full price for maize, our egg producers are now unable to dispose of eggs by export on an economic basis, and so long as the present ratio of costs to world prices remains the market for eggs will be largely restricted to internal sales. Thus self-sufficiency in grains, if achieved at high cost without due regard to efficiency, might serve to restrict our entry into export markets with livestock products when the export stage is reached.

The achievement of a large degree of self-sufficiency in basic foods without costly distortion of the agricultural economy requires not merely retention of control of prices of these commodities, together with control of import and export, it requires also that choice must be made in respect of incentives to expansion and the repercussions of high rates of incentive must be recognised. In addition, the closest co-ordination of controlled prices should be attained. If co-ordination and direction are to be soundly based a systematic body of information in respect of producton resources and costs needs building up without delay. The proposed agro-economic and land utilisation survey would provide much of the essential background information and preparatory work has been carried out by this branch with a view to commencing that survey in 1950.

Commodity costings, which provide indispensable data for the sound operation of price controls, were expanded during 1949. Maize costs were collected in respect of 34 lands, totalling 4,854 acres. Milk production costs and pig costs were continued with a view to appreciable expansion in 1950.

A survey of the economics of small scale irrigation was carried out in conjunction with the Irrigation Department and the Conservation and Extension Branch and the results will shortly be available for issue. The enquiry into farm labour utilisation and mechanisation was begun towards the end of the year and will be completed in 1950.

Throughout the year the Branch has provided a mass of information on the economics of production and marketing. Material was made available for the Engledow Report and much work was undertaken for the preparation of the annual Food and Agriculture Organisation report. The Registrar of Co-operative Companies has investigated the affairs of nearly all the registered companies and much necessary guidance has been given. The Chief Agricultural Economist has served as Chairman of the Maize Control Board, the Dairy Industry Control Board, and the Pig Industry Board, as a member of the Cotton Research and Industry Board, the Milk Marketing Committee and the Tariff Advisory Committee, as an adviser to the Agricultural Prices Advisory Board and as a member of several other departmental and interdepartmental committees and special working parties.

S. M. MAKINGS,
Chief Agricultural Economist.

# Summary of Annual Report of the Chief Dairy Officer for the Year ended 31st December, 1949

**Dairying Season.**—The dairying season 1948/49 was characterised by a rainfall which was well below normal. The season opened promisingly enough with good general rains in October and November, but these were unfortunately followed by a prolonged dry spell which lasted until the middle of January, by which time the food crop position in most areas had become really serious. The timely reappearance of the rains at this stage improved matters to some extent, but after the middle of February the rainfall became very patchy and finally tailed off disappointingly before the end of March. In general therefore the season was unfavourable for crop production and this is reflected in the yields of the staple grain and fodder crops which were well below average.

**Production of Dairy Produce.**—Despite an unfavourable season dairy production was fairly well maintained and, although figures are not yet available to show the aggregate milk production for the Colony, it is estimated that this reached approximately the same total as the previous year, which was itself a record.

The following figures show the production of milk, cheese and factory butter during 1949, as compared with production during the previous ten calendar years. It will be seen that cheese manufactures were about the same as those of the previous year, whilst factory butter on the other hand showed a fall of close on 20 per cent. This, however, was compensated for by an appreciable rise in the output of liquid milk which, it is estimated, reached the record figure of 5,000,000 gallons. Judging from the figures which reveal a steady expansion production, there is little doubt that had the season been more favourable, the total output of milk would have been well over nine million gallons. The occurrence of contagious sterility in many herds supplying fresh milk was an additional and important factor in the reduction of supplies.

### DAIRY PRODUCTION, 1939-49.

| Year | Butter (Factory Butter only) | Cheese | Liquid Milk | Total Milk Production |
|---|---|---|---|---|
| | 1,000 lbs. | 1,000 lbs. | 1,000 galls. | 1,000 galls. |
| 1939 | 1,098 | 351 | 1,400 | 6,040 |
| 1940 | 1,373 | 370 | 1,640 | 6,910 |
| 1941 | 1,350 | 359 | 2,020 | 7,190 |
| 1942 | 1,149 | 495 | 2,522 | 7,042 |
| 1943 | 1,315 | 543 | 3,038 | 7,871 |
| 1944 | 1,244 | 534 | 3,227 | 7,570 |
| 1945 | 1,174 | 600 | 3,185 | 7,750 |
| 1946 | 1,055 | 592 | 2,964 | 7,200 |
| 1947 | 1,107 | 368 | 3,518 | 7,500 |
| 1948 | 1,423 | 542 | 4,550 | 8,700 |
| 1949 | 1,154 | 543 | 5,100 (a) | 8,600 (a) |

(a) = Estimated.

**Creameries, Butter Production and Consumption.**—The rationing of butter continued throughout the year on the basis of 4-ozs. per person per week, except for a period of 4½ months during which the ration was raised to ½-lb. This was made possible by large scale importations of butter from Australia and Kenya. The following figures show the relation between consumption and production:—

### FACTORY BUTTER.

| Year | Consumption 1,000-lb. | Production 1,000-lb. | Shortfall 1,000-lb. |
|---|---|---|---|
| 1943/44 | 1,609 | 1,248 | 361 |
| 1944/45 | 1,300 | 1,237 | 62 |
| 1945/46 | 1,613 | 1,081 | 532 |
| 1946/47 | 1,671 | 1,010 | 661 |
| 1947/48 | 1,937 | 1,355 | 582 |
| 1948/49 | 2,056 | 1,281 | 775 |

It is apparent from these figures that the industry is not producing sufficient butter to meet the expanding requirements of the Colony, even on the present comparatively low basis of consumption which, assuming a European population of 120,000, amounted last year to approximately 17-lb. per head. Owing to the increasingly heavy calls on the industry for liquid milk, the prospects of making up the present shortfall between the consumption and production of butter appear somewhat remote, and the view has been expressed that consideration might well be given to the possibilities of utilising the Colony's available butter-fat for the manufacture of a high grade butter substitute in sufficient quantity to obviate importation and rationing. In fact this was one of the recommendations of the Parliamentary Select Committee which investigated the dairy industry during the period under review, and it is proposed to explore the possibilities of the suggested project as soon as facilities are available locally for the manufacture of the high grade substitute. Exports of butter during the year, chiefly to Portuguese East Africa, amounted to 80,182-lb., as compared with 46,618-lb. the previous season.

Imports amounted to 1,004,660-lb., compared with 537,216-lb. last year. The Price Equalisation Scheme operated by the Dairy Industry Control Board continued to function during the year and was responsible for the maintenance of the same basic prices for butterfat as the previous year, viz., 2s. 3½d. per lb. and 3s. 1½d. per lb. for First Grade summer and winter butterfat respectively; as from July onwards, however, these prices were raised by means of a Government subsidy to 2s. 5d. per lb. for summer butterfat and 3s. 4d. per lb. for winter butterfat in accordance with a recommendation of the Select Committee previously mentioned. Wholesale and retail prices for butter remained unchanged throughout the season at 2s. 8½d. and 3s. per lb. respectively for first grade butter. The first month of the new season, however, following on devaluation saw the discontinuance of the Government subsidy and its replacement by increases in the wholesale and retail prices for butter which were advanced respectively to 3s. 2d. and 3s. 6d. per lb. for first grade, whilst summer and winter prices for butterfat were simultaneously raised to 2s. 9d. and 3s. 7d. per lb.

Manufactures of first grade butter were below last year's figures.

**Cheese Factories.**—There was no change in the number of registered cheese factories in the Colony which still stands at six, of which five are co-operative. As previously mentioned, production of cheese was about the same as that of the previous year.

Exports to all markets were 52,872-lb., compared with 65,882-lb. the preceding year, whilst imports—mainly from New Zealand and Australia—were appreciably higher, amounting to 251,670-lb. against 158,575-lb. in 1948. Local consumption reached the figure of 769,971-lb. as compared with 554,628-lb. the previous year, and would no doubt have been higher had supplies been obtainable.

The season opened with the wholesale and retail prices of cheese fixed respectively at 1s. 10d. and 2s. 2d. per lb. On the 1st January these were raised by 2d. to 2s. and 2s. 4d. per lb., and were advanced again by a further 2d. per lb. on 1st July on the recommendation of the Select Committee.

A further increase of 3d. per lb. occurred on the 21st October following on devaluation, so that the closing prices at the end of the calendar year were 2s. 5d. per lb. wholesale and 2s. 9d. per lb. retail.

**Milk and Cream Supplies.**—As mentioned elsewhere the volume of milk entering the fresh milk trade exceeded that of the previous year by approximately half a million gallons and represented close on a four hundred per cent. increase over the liquid milk output in 1939.

Despite an expanding output, however, there was little surplus for fresh cream or for ice-cream manufacture; in fact in some of the larger towns there was a definite shortage of milk towards the end of the season.

The season opened with milk prices fixed at 4d., 4½d. and 4¾d. per pint respectively for cash, coupon and credit sales, and 2s. 6d. per gallon for bulk sales. These prices were maintained up to the end of March when the non-statutory milk marketing scheme, which had been operating up to that date, was abandoned, the subsidy paid thereunder discontinued and replaced by an all-round increase in consumer prices of 4d. per gallon.

Following, however, on the recommendations of the Select Committee on the Dairy Industry, the non-statutory milk marketing scheme was reintroduced on the 1st July with a new price structure whereunder producers were guaranteed an average price of 2s. 3d. per gallon (2s. 1d. in the summer and 2s. 5d. in the winter) for all milk supplied for the fresh milk trade in those areas where consumer prices had been fixed by statute. In practice the Milk Marketing Committee purchased the milk direct from the producer and re-sold it at a lower figure to the distributor, the difference being met by means of a subsidy. The guaranteed average price of 2s. 3d. per gallon applied to milk of a certain standard of compositional and hygienic quality, penalties being imposed or premiums added for milk falling below or above the standard. All sampling and testing of milk for this purpose was undertaken by the Dairy Officers of this Branch. There is no doubt that the payment of this guaranteed price for milk was of great assistance in maintaining supplies and that without this inducement the shortage of milk would have assumed more serious proportions and probably necessitated some form of rationing.

Closing prices for milk at the end of the season were thus as follows:—

| | | s. | d. |
|---|---|---|---|
| *Producer Price*: | per gallon for standard quality milk ......... | 2 | 3 |
| | (2s. 1d., Summer). | | |
| | (2s. 5d., Winter). | | |
| | (Maximum premium payable: 4d. per gallon). | | |

| | | s. | d. |
|---|---|---|---|
| *Retail Prices*: | per pint (cash and carry) ......... | 0 | 4½ |
| | per pint (coupon) ......... | 0 | 5 |
| | per pint (credit) ......... | 0 | 5¼ |
| | per gallon (bulk) ......... | 2 | 10 |

**Milk Recording.**—Milk recording continues to make progress, but due to the occurrence of contagious sterility in many herds under test, the number of cows and herds recorded did not reach the anticipated total of 10,000. The figures are as follows:—

HERD AVERAGES, 1948/49.

| Year | No. of Herds | No. of Cows Tested | Completed Lactations | Average Milk Yield lbs. | Average Production of Butterfat lbs. | Percentage of Butterfat | Days |
|---|---|---|---|---|---|---|---|
| 1930 ...... | 35 | 1,397 | 479 | 369 | 138 | 3.75 | 224 |
| 1940 ..... | 49 | 3,070 | 1,472 | 509 | 191 | 3.70 | 281 |
| 1945 .... | 130 | 7,000 | 3,532 | 605 | 221 | 3.66 | 278 |
| 1948 . | 180 | 9,025 | 4,699 | 581 | 217 | 3.73 | 278 |
| 1949 ... | 185 | 9,382 | 5,173 | 589 | 217 | 3.70 | 277 |

**Dairy Bonus Scheme.**—The fifth year of the Dairy Bonus Scheme ended on 30th September, 1949. The number of producers participating in the scheme was:—

144 as against 156 the year before.

DAIRY BONUS SCHEME, 1948/49.

| Year | No. of Participants | No. of Failures | Gallons of Milk on which Bonus Paid | Percentage of Total Milk Made into Cheese | lbs. Butterfat on which Bonus Paid | Percentage of Total Butterfat |
|---|---|---|---|---|---|---|
| 1944/45..... ..... | 100 | 1 | 435,790 | 57.7 | 245,655 | 24 |
| 1945/46....... ...... | 123 | 3 | 434,172 | 57.3 | 261,900 | 29 |
| 1946/47...... ...... | 143 | 1 | 165,773 | 41.4 | 273,000 | 32 |
| 1947/48...... ...... | 156 | 9 | 209,478 | 54.0 | 290,000 | 26 |
| 1948/49..... ..... | 144 | 14 | 265,832 | 44.3 | 216,140 | 22.5 |

The decrease in the number of producers participating in the scheme as well as the decline, as compared with the figures of four years ago, in the quantities of milk and butterfat on which the bonus has been paid is due mainly to the general trend within the industry for the diversion of industrial milk, which is eligible for the bonus, to liquid milk on which no bonus is payable.

J. CORRY,
Chief Dairy Officer.

# Summary of Annual Report of Chief Poultry Officer for the Year ended 31st December, 1949

**General Position.**—The industry has passed through a very difficult year, for the following reasons:—

1. Good prices in 1947 and 1948 encouraged abnormal expansion, with the result eggs stored late in 1948 carried over to 1949 could not be sold locally during the "scarce" season. Eggs were therefore the first food product to achieve a surplus in the post-war period.

2. Lower prices overseas and increased costs of feeding made it unprofitable to export eggs overseas.

3. High prices and some poor quality eggs resulted in lowered consumption.

4. When control was removed the price could not be maintained in the face of the surplus and prices dropped below cost of production, resulting in serious loss to producers.

5. Removal of the maize subsidy and devaluation further increased costs and added to the loss on poultry products.

6. The Rhodesia Poultry Products Co-op. became the dumping ground for the surplus and has therefore become seriously financially embarrassed.

The outlook at the end of the year is that contraction is taking place rapidly, but it is hoped some scheme to prevent excessive contraction, which will only result in shortages in 1950, will be arranged.

**Poultry Feeds.**—Grain feeds have been available and no serious shortages have occurred. Protein feeds of both animal and vegetable origin have been in short supply and imports at higher prices have been essential.

Grain prices have risen considerably.

By-products and offal feeds are considered to be too high in price for this class of feed.

**Egg Prices.**—The Maximum Egg Prices Order with the same prices as for 1948 remained in force until October 28th, when eggs were de-controlled. Since that date egg prices have fallen well below the equivalent 1948 figures at the end of the year.

Agitation from consumers against the quality and size of some eggs offered for sale led to a comprehensive scheme for regulating the grading of eggs being drawn up and submitted by this Department, but it was not accepted by Government. It is necessary, however, to have some standard to which all would adhere.

**Table Poultry.**—Farmers have enjoyed good prices for table poultry throughout the year and the price remained steady until overseas prices dropped 2d. per lb. for export birds. This has affected a certain class of young bird, but not the main local market to any extent.

**Poultry Statistics.**—

SUMMARY OF ANNUAL REPORT.

Imports of live poultry amounted to 11,464, valued at £1,905; of frozen poultry 23,188 lbs., valued at £1,941; of fresh eggs 1,335 dozen, valued at £359.

Exports of live poultry were 187,943, valued at £14.280; of frozen poultry 259,174 lbs., valued at £30,273; and of fresh eggs 115,788 dozen, valued at £18,452.

**Live Poultry and Eggs.**—The figures for 1949 will not be available until later, but the figures for 1948 which have not previously been reported are presented, together with 1947 figures.. It will be noted there is a considerable increase in hens and pullets, which would account for the increased production of eggs in 1949 which has been experienced.

POULTRY.

| Year | Cocks | C'kerels | Hens | Pullets | Ducks | Geese | Turkeys | Total |
|---|---|---|---|---|---|---|---|---|
| 1947 | 13,552 | 41,327 | 198,324 | 131,623 | 19,175 | 1,255 | 13.301 | 418,557 |
| 1948 | 18,238 | 58,148 | 231,175 | 163.214 | 21,154 | 1,443 | 16,794 | 510,346 |

EGGS (Dozens).

| Year | Production | Value | Consumption |
|---|---|---|---|
| 1947 ..... ...... . . | 1,420,430 .... | £150,882 . .. | 1.314,051 |
| 1948 .. .... ..... ... . | 1,764.250 ... | £206,398 .... | 1,646,668 |

The Consumption figure is the production less exports.

These figures are obtained from licensed farmers and others known to the Department only, and do not represent the accurate totals for the Colony.

**Poultry Station.**—The Poultry Station was maintained on the same level as in past years.

The breeding of pedigree birds of four breeds by progeny test methods continued. Stud cockerels were sold to the public to the value of £85, and egg sales to the General Hospital to the value of £1,240.

Importation of hatching eggs from the United States of America by air was tried with limited success, but a few individuals of high quality have been reared.

A project to test the value of "Stilboestrol" for "hormone" treatment of cockerels was in progress at the end of the year.

The 29th Annual Egg Laying Test terminated on January 30th, results of which have been published and which were quite satisfactory. The 30th Egg Laying Test commenced on March 1st with a full complement of birds from Rhodesia and the Union.

It has been decided to shift the Station to the Gwebi Agricultural School farm by degrees as buildings are completed.

**Shows.**—Poultry Shows were conducted by the local Poultry Clubs at the Agricultural Shows in Salisbury, Bulawayo, Bindura, Umtali and Gwelo, and were well supported. A departmental exhibit was staged at Salisbury.

**Extension Services.**—This important work was curtailed by shortage of staff and transport, but whenever possible visits were paid to farmers and Farmers' Associations requiring these services. Close contact was maintained with the Rhodesia National Farmers' Union through the National Poultry Committee of that organisation.

**Disease.**—For the first time Bacilliary White Diarrhoea was diagnosed on a farm near Salisbury. Sales of stock were stopped by the Veterinary Department and regular tests have eliminated all carriers in this flock. It is proposed to have pilot tests in various parts of the country and later commence 100 per cent. testing of all breeding stock on farms offering stock for sale.

No other serious outbreak of disease was recorded.

I wish to acknowledge the efficient services of the Manager, Government Poultry Station, Salisbury.

G. H. COOPER,
Chief Poultry Officer.

# Summary of Annual Report of the Chief Chemist for the Year ended 31st December, 1949

**General.**—The routine analytical and advisory work of the Branch has again expanded very considerably during the year.

Two members of the Staff have devoted their whole time to a survey of the irrigable soils of the Land Settlement farms at Umshandige. This survey is not yet complete. A preliminary reconnaissance of the Popotekwe Irrigation Scheme was also carried out.

**Soil Surveys.**—During nine months spent in the field the two officers permanently engaged on Soil Survey completed 13 farms at Umshandige. By employing field methods for pH and water-soluble salts, it was found possible to classify the soils provisionally for irrigability without waiting for laboratory analyses. Five hundred and five pits in all were examined. Work on the preparation of reports is proceeding.

During the year a preliminary reconnaissance of the Popotekwe Irrigation Scheme was carried out. The area was surveyed and gridded by the Irrigation Department and pits were sunk as requested by this Branch.

A broad Soil reconnaissance of the Eastern Districts was carried out during the year. During this tour a long-term forestry experiment at Stapleford Forest was examined and sampled.

Two private irrigation schemes were examined.

**Drainage.**—In collaboration with the Conservation and Extension Branch, drainage experiments involving different types of drains have been laid down at Umshandige.

**Conferences.**—In October the Acting Chief Chemist attended the African Regional Conference and read a paper on soil surveys.

**Laboratory Analytical Work.**—The classification of samples analysed or investigated during the year 1949 is as follows:—

| | |
|---|---:|
| Soil Survey Samples | 265 |
| Soils | 1,238 |
| Manures and Fertilisers | 37 |
| Farm Foods | 41 |
| Waters | 353 |
| Vegetable Products | 90 |
| Limes | 4 |
| Toxicological | 357 |
| Miscellaneous | 49 |
| Investigatory Work | 408 |
| **Total** | 2,842 |

These figures represent an increase of 33 per cent. over the previous year. Over 300 more soils have been submitted for analysis this year than last. Another feature is the fourfold increase in the number of farm foods submitted. The number of vegetable products of all kinds has almost doubled, and the number of samples in connection with investigatory work has also very greatly increased.

The Branch has, in addition, continued to supply the Veterinary Department with Standard Iodine Solution for dip-testing and this year prepared 238 litres.

**Soils** (1,238).—The demand noted last year for information on soils suitable for maize and general food crops has risen still further, 471 soil samples being submitted for maize alone. Samples totalling 225 were examined for plot holders and market gardeners. Samples submitted for tobacco (434) again showed a substantial rise.

As all samples are reported on individually it will be seen that advisory work takes up much of the time of the Staff.

**Fertilisers and Manures** (52).—Seventeen samples were taken under the Fertiliser, Farm Foods, Seeds and Pest Remedies Act. All but one conformed to the registration, and this one, after remixing and resampling, fell within the prescribed limits.

**Farm Foods** (41).—The number of farm foods sent in by farmers shows a more scientific approach to the problems of feeding.

**Waters** (353).—Work proceeded under this heading for the Irrigation Department, and in addition, there was a marked increase in the number of private samples of irrigation water sent in for analysis.

**Vegetable Products** (90).—Among the vegetable products analysed were numerous samples of hydrid and other maize from the Agricultural Experiment Station. No fall in the protein content of hybrid maize was apparent.

**Toxicological** (357).—There was an actual increase of 45 specimens from dead animals, as compared with the previous year. It is obvious that the danger inherent in arsenical dips, referred to in our report for 1948, has not diminished. In addition, six cases of mercury poisoning were found, the probable source of the mercury being the organic mercurials used for seed treatment.

**Miscellaneous** (49).—Although there was a marked drop in unclassified samples, there was the usual variety, which included vermiculite for pH, and bark for tannin.

**Investigatory Work** (408).—The experiments at Grasslands Experiment Station, Marandellas, and at Matopos, described in last year's report, have been continued during 1949.

Investigatory work has been commenced on the water-holding capacity and wilting-point of vermiculite and vermiculite mixtures. The variable pH of vermiculite has been found to be relatively unimportant if soil is present because of the buffering effect of the soil.

Preparatory work has begun on fundamental research into the availability of phosphate in Rhodesian soils. The degree of fixation, the estimation of the relative degrees of fixation, and the availability of the phosphate to plants under different conditions are all under investigation.

In conjunction with the Chief Tobacco Officer, research has been started at Trelawney into the effects of potash, phosphate and boron on the quality of Virginia tobacco.

During the year, a conductivity apparatus was devised for use in the field.

B. S. ELLIS,
Acting Chief Chemist.

# Summary of Annual Report of the Chief Agriculturist for the Year ended 31st December, 1949

**Season and Crops.**—The season which opened early and with such great promise, turned out to be little better than the unparalleled drought of 1947.

In fact, for many farmers it proved the third year of drought in succession, and bad crops, including the season 1947/48 when 1,912,005 bags of maize were reaped in the Colony.

The season can best be described as yet another disappointing one during the last decade. Alternating with hope and despair, the fortunes of the various districts were diverse. The season was characterised by good early rains commencing at end of October, followed by periods of drought.

By mid-January the maize crop threatened to become desperate within a week, but fortunately general rains with some heavy precipitations soon became general. The last good general rains of the season fell from the 12th to the 15th March. On the whole Matabeleland did not fare too badly for veld hay—where full advantage could be taken of this fodder and silage crops—and water supplies.

Despite unfavourable climatic conditions, it is pleasing to be able to record that notwithstanding the final reduction in acreage —due to failures and bad stands—a total of 303,735 acres of maize yielded 1,388,297 bags, or 4.57 bags per acre, compared with 323,432 acres, yielding 1,912,005 bags, or 5.90 bags per acre in the previous favourable season.

The four districts, i.e., Hartley, Salisbury, Lomagundi and Mazoe together produced a total of 918,764 bags, or approximately 70 per cent. of the total European crop. Matabeleland produced 175,672 bags, or 3.2 bags per acre, from 55,510 acres reaped.

The season was also a disastrous one for wheat, as the summer drought severely affected water supplies. Most of the largest producers and many small growers with irrigation planted no wheat, and the moisture-retaining vleis dried up early.

A total of 540 moisture tests were carried out by the Plant and Grain Inspection Staff at the request of the Maize Control Board and farmers; and a number of samples were classified for the Board.

A good farming bonus of 2s. 4d. per bag was paid in respect of maize qualified under the terms of Government Notice No. 854 of 19th November, 1948. Of the 552 growers who registered for the bonus, 435 or 79 per cent. were assessed for the payment. No good farming bonus will be paid in respect of the 1949/50 maize crop. The guaranteed price for that crop has been fixed at 35s. per bag.

**Certified Seed Maize.**—Commercial double hybrid certified seed maize made its debut in 1949. The demand greatly exceeded the supply. The total of 1,774 bags of double hybrid seed was produced on 353 acres. About 2,500 acres of hybrid breeding plots have been sown in the 1949/50 season. If growers are successful and the average yield is six bags per acre, some 15,000 bags of double hybrid seed will be available for sowing in the 1950/51 season. If each bag sows only 16 acres, there will be enough seed to sow 240,000 acres of commercial maize.

**Hybrid Maize Breeding Programme.**—Maize, the most important food crop in the Colony, received primary consideration in plant breeding work. Many hundreds of in-bred strains were sown in individual plots for selection, further in-breeding and double hybrid combinations were made for purposes of trial, both on this Station and in other parts of the country. Over 250 purebred strains were planted in duplicate plots for further in-breeding on the Salisbury Experiment Station.

The bulking of in-breds, and the making of single hybrids is being undertaken at both the Henderson Research Station and the Gwebi Experiment Farm, attached to the Agricultural College, for the production of double commercial hybrid seed by members of the Southern Rhodesia Seed Maize Association. At the former Station 80 acres are planted for the production of single hybrids and four acres to in-bred bulks; and 70 and 4 acres respectively at the latter Station. Given a normal season, the resultant crop will provide more seed than is required to produce double hybrid seed for the Colony's total requirements and provide a reserve to draw on if and when required. During the season 1948/49, 1,227 lbs. of in-bred, 75 bags of single hybrid and 605 bags of double hybrid seed was produced by the two Stations.

Rotation trials show the great benefit obtained by growing legumes for ploughing under as green manure. The effect of a green manure crop is short lived; the second crop of maize after green manure is only a little over half that of the crop directly following the green manure. There is some indication that the beneficial value of a good green manure crop approximates to a dressing of six tons of compost together with the rotational effect of a legume grown for hay. More exact information on this point will be obtained at a later date. Of those crops under trial for purposes of green manure, velvet beans gave better results than a late sown crop of sunn hemp.

**Legumes.**—The dry season was unfavourable for the growing of soya beans. In the trial in which a number of soya bean strains and the best ground nut varieties are compared for their yields of protein and oil, the ground nuts produces more protein and four times the quantity of oil.

The variety Mars provided the heaviest yield of seed of the four dwarf, early maturing varieties of sunflower under trial. It was followed by Pole Star, Southern Cross and Jupiter in that order. Mars, however, had a lower oil percentage than each of the other three varieties.

**Mechanisation of Maize Crop.**—The feasibility of completely mechanising the growing of the maize crop, including the picking of the ears, was investigated on a field of 65 acres on the Gwebi Experiment Farm. All the mechanical operations in the growing of the 65 acres are given below. The actual operating times were taken from the meter on the tractor:—

| | |
|---|---|
| Ploughing Three-Furrow Disc | 109 hours. |
| Fertilising | 43 ,, |
| Pre-Cultivation with Disc Harrow | 16 ,, |
| Planting Maize | 17 ,, |
| Cultivation S/Tooth Harrow, Four Sections | 11 ,, |
| Cultivation S/Tooth Harrow, Four Sections | 8 ,, |
| Discing between 6-foot rows, single spacing | 20 ,, |
| Discing between 6-foot rows, single spacing | 20 ,, |
| Cultivating for Witchweed | 20 ,, |
| Cultivating for Witchweed | 20 ,, |
| Picking by Machine | 66 ,, |
| | 350 hours. |

The actual cost per hour of tractor working time can be assessed by the individual farmer using a similar tractor. In this test the strain of maize grown was a top-cross. The use of hybrid seed should reduce the picking time. The method employed for inter-row cultivation, including discing, proved successful and all weeds were coped with. The yield was 651 bags or 10 bags per acre.

The following summary of Revenue of Gwebi Farm from 1st January to 31st December, 1949, very clearly reflects the financial side of the farming operations:—

| | | | |
|---|---|---|---|
| Sales: Total Livestock Cattle, Dairy and Pigs Sales | £4,350 | 18 | 6 |
| Agricultural Crops— | | | |
| Sale of Seed, etc. | 499 | 2 | 9 |
| Sale of Maize, including Seed | 3,499 | 10 | 0 |
| | £8,349 | 11 | 3 |

**Matopos Research Station.**—200 acres of maize were planted. Owing to the drought 70 acres planted after the rains ceased, on the 2nd December, failed to produce a crop. The remaining 130 acres produced very good grain yields and excellent yields of maize silage were reaped. Approximately 800 tons of silage were made and 700 bags of grain were reaped.

Approximately 100 tons of velvet bean hay were made for stock. Cowpeas do not appear to be well suited to the heavy soils on this Station. Hay making conditions were very good and hay of excellent quality was made. Approximately 1,000 tons of hay were made from 800 acres. It was more than adequate for all requirements.

**Farmers' Day.**—A very successful Farmers' Day was held on 23rd April. It is estimated that approximately 400 farmers attended, which brought the total number of visitors to the Station to 539 for the year.

There are now two crop experiment Stations on the Matopos Research Station: one is situated on the heavy soil area and the other on the granite sandveld area. It was possible only to open the Station on the heavy soil area in 1948/49.

Over 400 selfed selections of maize were made during the past season. Twenty-nine varieties of sorghums were under trial. Several varieties show very great promise and it is hoped that they will occupy a very important place in the economy of the Colony in the near future.

Fifty-six varieties of wheat were grown in small plots; twenty of these were new introductions from Kenya. Several show considerable promise. A new Punjab strain, obtained from India, which has replaced Punjab 8A in that country, shows very great promise in this Colony after one season's trial.

**Turkish Tobacco and Plant Breeding Station—Umgusa.**—In spite of the drought another very successful season was experienced on this Station, which serves to emphasise the great agricultural value of the Gusi sand areas of the Colony for crop production.

Five hybrid maize strains tested yielded significantly higher than Potchefstroom Pearl.

D. E. McLOUGHLIN,
Chief Agriculturist.

# Summary of Annual Report of the Chief Botanist and Plant Pathologist for the Year ended 31st December, 1949

**Movements.**—103 farms were visited in 13 districts. Frequent inspections were made of tobacco auction floors and grading sheds, and gardens were inspected for tomato spotted wilt virus (Kromnek) in dahlias in Salisbury and Bulawayo.

The Chief Botanist and Plant Pathologist attended the African Regional Scientific Conference in Johannesburg, as a member of the Central African delegation. The Senior Plant Pathologist attended the 23rd Annual Congress of South African Sugar Technologists at Durban and visited Canada and the United States of America to enquire into tobacco research on behalf of the Rhodesia Tobacco Association.

**Publications:** By J. C. F. Hopkins.—"A Revised Descriptive List of Plant Diseases and Fungi in Southern Rhodesia" (in the press); "Long Term Botanical Research" (African Regional Scientific Conference); "Annual Report, 1949," ("Rhodesia Agricultural Journal," July-August).

## PLANT PATHOLOGY.

**Laboratory.**—542 specimens were received, among which were 18 new records for Southern Rhodesia. They were:—

Root rot of sunn hemp due to *Thielaviopsis basicola*; charcoal rot of Irish potato due to *Macrophomina phaseoli*; cob rot of maize due to *Nigrospora oryzae*; whiptail of cauliflower due to molybdenum deficiency; grey mould of *Cardamine africana* due to *Physarum cinereum;* malformation of tobacco seedlings due to boron toxicity: vein thickening of tobacco due to unknown cause (has been reported from Mauritius and may be a form of leaf curl); stem rot of cassava due to *Botryodiplodia theobromae;* rust of *Rubus* (indigenous) due to *Hamaspora longissima*; anthracnose of avocado fruit due to *Glomerella cingulata;* leaf spots of violet due to *Ascochyta violae* and *Colletotrichum violae-rotundifoliae*; mildew of *Sclerocarya caffra* due to *Ovulariopsis* sp.; trunk rot of baobab due to *Ceratocystis* sp.: *Cicinnobolus cesati* on mildew of pumpkin; and the following fungi *Tricamphora pezizoidea*, *Stemonitis splendens*, *Ganoderma curtisii* ond *Thelephora terrestris*.

Two new records are of particular importance, namely, *Thielaviopsis basicola* on sunn hemp and *Nigrospora oryzae* on maize. The former is the fungus causing black root rot of tobacco, which has not so far been reported from the Colony, and the latter, which caused severe damage to inbred maize cobs, has not before been of any consequence on established open pollinated varieties.

Charcoal rot of Irish potatoes is a single record and was found on a crop planted under hot, dry conditions.

The disease simulating severe leaf curl in tobacco was found on a single plant and there was no evidence of its spread.

A wilt of *Urena lobata* associated with *Fusarium* spp. was examined but the disease did not appear to be serious and was confined to a small patch.

A system of making permanent slides of important fungi has been started and the museum specimens have all been renovated. The library has been re indexed on a numerical system.

## CROPS.

**Tobacco.**—On the whole the tobacco crop was unusually free from disease in the field, presumably due to the dryness of the season, but despite this there was a large amount of frog-eye (*Cercospora nicotianae*) barn-spotting in the leaf sent to the auction floors. This was particularly noticeable during the last months of the sales. Brown spot (*Alternaria longipes*) was not common.

Rosette was widely distributed in the late plantings and reports of heavy losses were received. Warnings about such a possibility had been issued during the earlier part of the season and some growers had taken the precaution of spraying their late plantings with a residual aphicide with good results.

Instances of almost complete recovery from rosette were observed very late in the season. Such occurrences are contrary to general experience of this disease and no explanation has so far been advanced.

Lightning injury was reported on many occasions and was the cause of reports of a new and dangerous disease. In one instance plants were killed in numerous patches distributed irregularly over a 15-acre field.

The new leaf spot caused by *Ascochyta* sp. was found on a few leaves at Karoe, but no outbreak of the disease was observed or reported.

*Pythium aphanidermatum* was again found causing a severe damping-off in seed beds and foot rot in transplants during a spell of hot, dry weather towards the end of the year.

Wildfire has been prevalent during the early part of the 1949/50 season in some districts.

Doubts have been thrown on the efficacy of seed treatment, but seed known to be infected by *Ps. tabaci* has been treated with silver nitrate in the laboratory, then crushed and kept in sterile nutrient broth for over a week without the development of any bacteria or fungi. Such seed germinated normally in germination tests.

**Maize.**—A foot rot of young maize plants occurred in several districts. Plants became chlorotic and some died; a brown rot was present at the base of each. This was reported to be affecting hybrid and not open pollinated varieties and appeared during a period of hot, dry weather, which checked growth following rains. Investigations showed the rot to be caused by *Fusarium moniliforme* var. *subglutinans*, which killed the tap root before the adventitious roots had developed sufficiently to support the young plants. A few days after good rains had fallen, side roots were put out and the remaining young plants grew normally. Both hybrid and open pollinated varieties were affected.

**Sunn Hemp.**—Numerous reports of lodging of well grown crops were received. Specimens examined showed the presence of lesions near the bases of the stems of affected plants, which were associated with a species of *Colletotrichum* not yet identified and *Macrophomina phaseoli*. Investigations are proceeding.

**Ground nuts.**—*Cercospora* leaf spot was common but caused no serious injury.

Rosette was widespread and caused losses in Lomagundi. It was associated with poor stands of plants due, presumably, to drought.

**Forestry.**—Reports have been received of the deaths of well established conifers in several parts of the Colony. A number of specimens were examined but no known pathogen was found. It is thought that the deaths were due to lowering of the subterranean water table following the past three seasons of subnormal rainfall.

**Fruit, Flowers and Vegetables.**—Peach mildew has increased in intensity and has caused considerable damage. Leaf curl caused defoliation of trees in some parts of the Eastern Districts.

Whiptail of cauliflowers (a new record) has been seen twice. Affected plants were treated with a solution of ammonium molybdate at the rate of 1 lb. per acre. After three weeks the young leaves of treated plants made normal growth whilst those of the controls remained typically distorted. No improvement in the development of the curd was observed, which could be accounted for by the advanced age of the plants when treated.

Typical symptoms of 2, 4-D injury were obesrved in young papaw, zinnia and *Callistephus chinensis* plants growing in pots 20 yards from empty tins which had contained a proprietary 2, 4-D herbicide.

**Cotton.**—A very severe leaf spotting due to *Alternaria gossypina* was received from Portuguese East Africa. Such severe form of the disease has not been recorded in Southern Rhodesia, but the identity of the fungus was confirmed.

## RESEARCH.

**Tobacco.**—A programme of disease research to be carried out at Trelawney and Karoe by the Plant Pathologist seconded for the purpose was drawn up in collaboration with the Tobacco Research Branch. It was largely a continuation in more detail of the work done by the Plant Pathology Branch during the past four years, and results will be published in full by the Tobacco Research Station.

The principal lines followed were (1) further investigations of the effect of priming on the incidence of spot diseases and the quality and weight of the crop; (2) a detailed examination of the efficacy of a wide range of new fungicides using the single plant as a unit; (3) continuation of field spraying trials in a modified form; and (4) a study of species of Alternaria associated with tobacco and common solanaceous weeds.

The following is a summary of results from last year's trials:

(a) Priming reduced the amount of frog-eye field and barn spot and improved the quality of the leaf without reducing the yield, but gave no financial gain under conditions of low rainfall and sellers' market.

(b) Significant reduction in frog-eye barn spotting was obtained by field spraying, but the incidence of disease was so low owing to the dry season that the differences were small.

(c) The depressing effect of sprays on the amount of disease in adjoining unsprayed control plots was again noted and shown to be significant.

(d) Home-made Bordeaux mixture registered the highest efficiency of the fungicides tested.

Miss Hall, of the Tobacco Pest Control Research Scheme, collaborated in the investigation of fungicides by assessing the L.D.50 of each by the slide technique.

Field spraying trials by helicopter were carried out by Tobacco Pest Control Research Scheme officers and followed closely. The equipment used was found to be unsuitable for the application of fungicides to tobacco and it was concluded that more fundamental research was required to bring practical field work into line with promising theoretical possibilities.

**Sugar Cane.**—Considerable attention was paid to smut disease (*Ustilago scitaminea*). Smut developed in the following newly introduced varieties when exposed to field infection: Co's 313, 453 and 464; N. Co's 79, 151, 291, 292, 313, 323, 330, 349, 351; M. 270. Of these, Co's 453 and 464 have developed the greatest number of smut whips.

Field observations suggest that smut is disseminated by both wind and water, particularly the latter. An isolated plot containing a duplicate set of newly introduced varieties has remained free from smut for more than 12 months.

The incidence of smut throughout the Triangle plantings has substantially declined since the large scale eradication of the highly susceptible Co. 301. No marked increase of the disease has been noted amongst the Co. 281 and 290 plantings. In these varieties control measures are now confined to the removal of smut whips only.

**Fruit.**—The spraying experiments for the control of apple diseases at Rhodes Estate, Inyanga, were continued in more detail. Better control of mildew than in the past was obtained with lime-sulphur.

Borax added to the soil increased the total crop of O'Hinemuri apples by approximately three times, but did not reduce the proportion of cracked fruit. Response to zinc sprays was also obtained.

**Forestry.**—Root material and cultures of mycorrhizal fungi of *Pinus radiata* were obtained from Tasmania and New Zealand. Seedlings were infected and sent to Stapleford Forest Reserve for comparison with plants inoculated with the local mycorrhizal fungus in their resistance to *Diplodia pinea*. A radiomised block experiment has been laid out by the District Forest Officer..

## SEED TESTING.

In the early part of the year the survey of agricultural seeds being sold in Rhodesia was continued with generally satisfactory results.

The resignation of the Assistant Seed Analyst in June reduced the staff to a learner assistant and seriously upset the work of the laboratory. The tests for the Southern Rhodesia Seed Maize Association could only be accomplished with the assistance of the Plant Pathology staff.

Germination tests on samples of seed issued by the Government Dehydration Factory to farmers were carried out.

## BOTANY.

**Herbarium**—Accessions.—4,130 specimens were added to the Herbarium. These included two species new to science, namely, *Clerodendron wildii* Moldenke and *Mesanthemum africanum* Moldenke. A further 371 were named for the Department of Native Agriculture and returned to the Director.

Individual collections of special interest were received from Mr. N. C. Chase; the Senior Pasture Research Officers, Matopos and Grasslands Experimental Stations; Drs. Fisher and Schweikerdt, of Natal University; and the Department of Native Agriculture. About 30 per cent. of the work of the Herbarium has consisted of determinations for Government Departments.

**Dictionary of Native Names.**—The bulk of the manuscript of a dictionary of native and common plant names is now completed and an official of the Native Affairs Department is at present checking the orthography. The book has been written mainly for use by field officers and farmers.

**Special Studies.**—Dr. Moldenke, of New York Botanic Gardens Herbarium, has named the entire collection of Eriocaulaceae and all duplicate material of Verbenaceae, of which families he is an authority.

Professor Karl von Suessenguth, of Munich, is studying our Amaranthaceae and has named all available duplicate material. In collaboration with Professor Merxmuller he is also elaborating the collection of Marandellas plants made by Mrs. Dehn, and it is hoped to publish this small regional flora in a Rhodesian journal in the near future. It will contain descriptions of a number of new species.

Studies are also proceeding on the genera *Otiophora*, *Bulbostylis*, and *Fimbrystylis*, with the assistance of Mr. Verdcourt, of Kew, and Miss Huntley, of Natal University.

**Royal Botanic Gardens, Kew.**—Great assistance has been given by the Director and Staff in the authoritative naming and checking of a very large number of plants, mostly collected during past reconnaissance surveys. With this assistance it will be possible in the near future to publish a number of surveys already made.

**Other Exchanges.**—Among other exchanges, valuable collections have been received from the National Herbarium, Pretoria, and arrangements have been made with the New York Botanic Gardens Herbarium for a set of the Vernay Nyasaland Expedition, 1946, material to be sent to us.

**Surveys.**—(1) A short survey of Triangle Sugar Estate in connection with extension of cane planting.

(2) A short survey of the Chimanimani Mountains in company with Mr. R. C. Munch, of Rusape, to whom thanks are due for organising camping arrangements. This was mainly a reconnaissance to prepare for a larger expedition in 1950.

(3) Umshandige Settlement Area, where a large collection of plants was made and many of the more common species named in the field for local departmental officers.

(4) A more thorough survey of the flora of the Victoria Falls Reserve at the invitation of the National Commission for the Preservation of Historical Monuments and Relics. An illustrated article and check list of all plants recorded from the Falls has been written and will be included in the scientific guide to the area which is being prepared by the Commission.

**National Botanic Gardens.**—The south-western section has been selectively stumped to remove diseased and disfigured trees and bush, and the rocky outcrops cleared of undergrowth preparatory to planting aloes. Owing to financial stringency no other constructional development has been possible.

The whole area has been re-surveyed and fenced.

## ECONOMIC BOTANY.

A good number of poisonous plants have been reported on including *Dichapetalum cymosum* (Hook.) Engl. causing deaths of cattle near Bulawayo and Que Que; *Cassia occidentalis* L., suspected of poisoning a dog; *Capperis tomentosa* Lam., causing death and sickness of natives who drank infusions of the roots; *Urginea altissima* Bak. bulbs, used for malicious poisoning of cattle; and *Sphenostylis erecta* Hutch., said to be used as a fish poison.

The following medicinal plants were recorded:—

*Cycnium adonense* E. Mey., as a snake bite cure; *Pentsia schistostephioides* M. R. F. Taylor, in treatment of duodenal ulcers; *Onicus benedictus* L., and *Euphorbia monteiroi* Hook., f., as emetics.

*Abutilon angulatum* Mast. was reported as a fibre plant.

A large number of enquiries concerned weeds and advice was given on the use of selective weed killers.

*Richardia braziliensis* (Moq.) Gomed, which is often troublesome in arable lands, was reported from Umtali to be much relished as a food by cattle and poultry.

The Botanist has written the descriptions for a handbook on poisonous plants of the Marandellas district to be published shortly by the Marandellas Farmers' Association. It is being sponsored by Mr. W. F. Collins and will contain a number of coloured plates prepared by Mrs. Dehn. It has been written in popular style for use by farmers.

**Noxious Weeds.**—New outbreaks of water hyacinth were found in the Makabuzi and Hunyani Rivers, which necessitated the engagement of additional labour to bring it under control. Systematic spraying with 2,4-D preparations has reduced the infestation in the Makabuzi River to the smallest since eradication work began. No spray material yet tested has given a complete kill with one application, and it was found necessary to do spot spraying later on small plants which survived. Re-infestation by seedlings still continues, but the general position has improved.

## GENERAL.

**Lectures and Meetings.**—The Chief Botanist and Plant Pathologist addressed the Rotary Club and the National Affairs Association on the subject of botanic gardens. The Botanist delivered a lecture on "Problems of Plant Distribution" to a joint meeting of the Rhodesia Scientific Association and the Botanical Society of Rhodesia. The Chief Botanist and Plant Pathologist attended Farmers' Day at Karoe.

**Agricultural Shows.**—The Chief Botanist and Plant Pathologist judged at the Salisbury and Umtali Agricultural Shows, and the Senior Plant Pathologist at the former. The usual departmental exhibit was staged.

**Visitors.**—Among visitors to the laboratories were Dr. G. A. C. Herklots, of the Colonial Office, Dr. Watts Padwick, formerly Imperial Mycologist in India, Mr. G. B. Symes, of the Colonial Insecticide Committee, Mr. D. F. Retief, Tobacco Research Officer, Rustenburg, and Mr. H. M. Usher, General Manager, Sena Sugar Estates, whilst Herbarium facilities were afforded to Mr. J. Gomez Pedro, of the Centro de Investigacao Cientifica Algodocira, Lourenco Marques, Fr. J. Gerstner, Mr. F. C. Greatrex, and Mr. K. Palgrave.

The Chief Botanist and Plant Pathologist continued to serve on the Tobacco Research Board, Plant Regulatory Board, Divisional Co-ordinating Committee and *ex-officio* on the Seed Maize Association Executive. The Senior Plant Pathologist attended meetings of the Sugar Industry Board and acted as alternate for the Chief Botanist and Plant Pathologist.

Acknowledgement is made of valuable assistance given by the Directors and Staffs of the Royal Botanic Gardens and Commonwealth Mycological Institute, Kew, the British Museum (N.H.), Departments of Agriculture, Pretoria and Lourenco Marques, Lunds Museum, New York Botanic Gardens Herbarium, and the Botanische Staatsammberg, Munich.

Thanks are also due to the Departments of Forestry of Tasmania and New Zealand for the supply of material and cultures of mycorrhizal fungi of *Pinus radiata*.

J. C. F. HOPKINS,
Chief Botanist and Plant Pathologist.

# Southern Rhodesia Veterinary Report

APRIL, 1950.

**General.**—Rainfall varied greatly throughout the Colony. Grazing remained good, but the water position will increase in gravity as the year advances. Cattle were reported to be in good condition, but movements for drought reasons were necessary within the Fort Victoria and Bulawayo areas and from the latter to the former.

**Tick Life.**—A decline in tick life is reported from most districts The following quarantine notices were issued during the month: Salisbury 7, Bulawayo 3, Gwelo 3, Fort Victoria 6.

**Scheduled Diseases.**—

1. African Coast Fever: Nil.
2. Theileriosis: With the exception of Melsetter District, where one death occurred, mortality has ceased in all districts infected.
3. Anthrax: Inoculation was completed in the Belingwe Reserve, Bulawayo District.
4. Foot and Mouth Disease: Nil.
5. Glanders or Farcy: Nil.
6. Heartwater: Ten cases of a mild strain were confirmed in imported sheep in the Bulawayo District. Inoculation is receiving attention.
7. Lungsickness (Contagious Pleuro Pneumonia of Cattle): Nil.
8. Mange in Horses, Mules, Donkeys and Camels: Occasional cases of Head Mange were reported in the Salisbury District.
9. Pyaemia or Epizootic Lymphangitis: Nil.
10. Redwater: Cases were reported in the following Districts:—
    Salisbury, Bulawayo 10, Umtali 3, Gwelo 1, Melsetter 3.
11. Rinderpest: Nil.

12. Swine Erysipelas: Nil.

13. Swine Fever: Nil.

14. Quarter Evil: Cases were reported in all Districts with the exception of Melsetter District.

15. Tuberculosis: Twenty cases in cattle from Messrs. Liebigs Ranch were diagnosed at West Nicholson, Bulawayo District.

16. Scab: Three cases were reported in the Bulawayo District.

17. Rabies: Nil.

18. Senkodo Disease: Occurred in the Bulawayo District.

19. Trypanosomiasis: As a result of inoculation the heavy mortality in the Mkoto Reserve, Salisbury District, was considerably reduced. One case occurred in the Melsetter District and ten cases in the Chipinga District.

20. Contagious Epididymitis and Vaginitis (Epi-Vag): One fresh focus of infection was found in Gwelo and one in Bulawayo. No farms, other than one in Fort Victoria quarantined for in contact reasons, were released. Improvement in infected herds was recorded in Fort Victoria and inspections were maintained throughout.

21. Lumpy Skin Disease: Mild cases were reported in the Salisbury, Bulawayo and Gwelo Districts.

22. Contagious Abortion: Confirmed in the Salisbury, Bulawayo and Umtali Districts.

**Scheduled Poultry Diseases.**—

23. Spirochaetosis: Nil.

24. Coccidiosis: Nil.

25. Fowl Typhoid: Confirmed in the Salisbury, Umtali and Gwelo Districts.

26. Bacillary White Diarrhoea: Confirmed in the Bulawayo and Umtali Districts.

27. Tuberculosis: Nil.

28. Chicken Pox and Roup: Infection diagnosed in the Salisbury and Bulawayo Districts.

**Other Diseases.**—

29. Gallsickness: Cases were reported in all Districts.

30. Paratyphoid: Nil.

31. Geilsiekte: Three cases were reported in the Bulawayo District.

32. Horse Sickness: The following cases were reported: Salisbury 2, Bulawayo 6, Fort Victoria 2.

33. Biliary: One case occurred in the Salisbury District and one case in the Bulawayo District.

34. Sweating Sickness: Continued in the Bulawayo, Gwelo and Fort Victoria Districts. An acute outbreak in the Umtali District responded to treatment.

35. Opthalmia: Prevalent in all Districts.

36. Screw Worm: Prevalent in all Districts.

37. Coccidiosis: Nil.

38. Internal Parasitis: Still apparent in the Melsetter District.

39. Stiff Sickness: Reported in the Umtali District without mortality.

40. Calf Diphtheria: An outbreak occurred at the Rhodes Matopo Estate, Bulawayo District, where nine deaths were reported.

41. Marete Disease (Sheath Obstruction): Noticed in the Fort Victoria District.

**Poisoning.**—

42. Veld Poisoning: Cases occurred in the Umtali, Gwelo and Melsetter Districts.

43. Mineral Poisoning: The following deaths from Arsenical Poisoning were reported: Salisbury 11, Bulawayo 4, Umtali 14, Gwelo 3, Melsetter 3.
Five cases in the Umtali District and two deaths in the Gwelo Districts were also reported, the cause of poisoning being unknown.

**Mallein Testing.**—82 horses and 68 donkeys tested with negative results.

**Tuberculin Testing.**—23 bulls, 4 cows and 31 heifers tested with no positive reactors to the test.

**IMPORTATION:**

**Union of South Africa.**—50 cows and calves breeding, 47 bulls, 17 horses and mares, 30 geldings, 3 pigs breeding, 12 sheep and lambs breeding.

**Northern Rhodesia.**—Nil.

**Bechuanaland Protectorate.**—65 bulls slaughter, 385 oxen slaughter, 21 cows and calves slaughter, 54 pigs slaughter, 402 sheep and lambs slaughter.

## EXPORTATION:

**Portuguese East Africa.**—15 bulls, 91 oxen slaughter, 40 cows and calves slaughter.

**Northern Rhodesia.**—6 bulls, 68 donkeys and Jackasses, 3 pigs breeding.

**Union of South Africa.**—1 gelding, 19 pigs breeding.

**Belgian Congo.**—1 horse and mares, 10 geldings.

## EXPORTATION—MISCELLANEOUS:

**Union of South Africa.**- 28,440 lbs. Hindquarters Beef; 1,000 lbs. Livers; 6,181 lbs. Sausage Skins; 38,516 lbs. Dripping.

**Bechuanaland Protectorate.**- 124 lbs. Sliced Bacon; 104½ lbs. Cooked Shoulder.

**Northern Rhodesia.**—10,028 lbs. Sides; 6,105 lbs. Saddles; 58 lbs. Rolls; 1,843 lbs. Gammon; 2,029 lbs. Cooked Shoulders; 966 lbs. Sliced Bacon.

**Belgian Congo.**—120,860 lbs. Quarters Beef; 10,363 lbs. Offal; 228 lbs. Bungs (No. 1); 232 lbs. Middles; 1,878 lbs. Tripe; 2,788 lbs. Mutton; 5,530 lbs. Veal; 3,729 lbs. Chickens; 253 lbs. Fowls; 250 lbs. Ducks; 2,868 lbs. Goats.

## MEAT PRODUCTS FROM LIEBIGS (RHODESIA) LTD., West Nicholson:

**Union of South Africa.**—229,560 lbs. Corned Beef; 11,700 lbs. Vienna Sausage; 1,650 lbs. Liver Roll; 7,200 lbs. Steak and Kidney; 10,800 lbs. Braised Steak and Onions; 13,248 lbs. Curried Beef; 720 lbs. Braised Liver; 1,410 lbs. Potted Meat.

**Belgian Congo.**—16,200 lbs. Corned Beef.

(Sgd.) J. S. ADAMSON,
Acting Director of Veterinary Services.

## MAY, 1950.

**General.**—Grazing deteriorated in all districts as the result of an inadequate rainfall during the season.

The water position must be considered serious and drought conditions prevailed in many areas. Cattle were reported to be in fair condition.

**Tick Life.**—With the exception of Bulawayo and Fort Victoria Districts, there was a decline in tick life. The following quarantine notices were issued during the month: Salisbury 16, Bulawayo 4, Umtali 3, Gwelo 13, Fort Victoria 20.

**Scheduled Diseases.**—

1. African Coast Fever: Nil.

2. Theileriosis: Three cases occurred in the Melsetter District.

3. Anthrax: Nil.

4. Foot and Mouth Disease: Consequent on the outbreak in Bechuanaland, a strong cordon was placed along the Bechuanaland/Southern Rhodesia Border.

5. Glanders or Farcy: Nil.

6. Heartwater: Heavy mortality occurred at Messrs. Liebigs Ranch, West Nicholson. The cattle emanated from the Fort Victoria District.

7. Lungsickness (Contagious Pleuro Pneumonia of Cattle): Nil.
8. Mange in Horses, Mules, Donkeys and Camels: Nil.

9. Pyaemia or Epizootic Lymphangitis: Nil.

10. Redwater: Cases were reported in all Districts with the exception of Fort Victoria District.

11. Rinderpest: Nil.

12. Swine Erysipelas: Nil.

13. Swine Fever: Nil.

14. Quarter Evil: Cases were reported in the following Districts: Bulawayo, Gwelo (51 deaths), Fort Victoria and Melsetter.

15. Tuberculosis: Tests were made in the Salisbury, Bulawayo, Umtali and Gwelo Districts. Infection occurred in cattle from Messrs. Liebigs Ranch in the Bulawayo District.

16. Scab: Nil.

17. Rabies: Nil.

18. Senkodo Disease: Nil.

19. Trypanosomiasis: In the Chikwiso Reserve, Salisbury District, 4 smears were positive *T. vivax* and 46 smears *T. congolense*.
In the Sebungwe area, Gwelo District, 2 cases *T. congolense* occurred.
Cases also occurred in the Chipinga District.

20. Contagious Epididymitis and Vaginitis (Epi-Vag): In the Salisbury District 3 fresh centres were confirmed.
581 bulls on 198 farms were inspected, of which 12 bulls were found infected and a further 7 bulls are under further observation.
Two farms were released from quarantine.. In the Bulawayo District one cross-bred bull was found infected at a Native Cattle Sale (Matati) and destroyed. No fresh centres of infection were found.
There was no change in the Fort Victoria and Gwelo Districts.
Melsetter and Umtali areas remain free of the disease.

21. Lumpy Skin Disease: A few mild cases were noted in the Salisbury, Bulawayo and Gwelo Districts.

22. Contagious Abortion: Confirmed in the Salisbury, Bulawayo and Umtali Districts.

**Scheduled Poultry Diseases.**—

23. Spirochaetosis: Nil.

24. Coccidiosis: Three cases occurred in the Salisbury District.

25. Fowl Typhoid: One case reported in the Umtali District.

26. Bacillary White Diarrhoea: Nil.

27. Tuberculosis: Nil.

28. Chicken Pox and Roup: Nil.

**Other Diseases.**—

29. Gallsickness: Cases were reported in all Districts with the exception of Fort Victoria.

30. Paratyphoid: Nil.

31. Geilsiekte: Two cases were reported in the Bulawayo District.

32. Horse Sickness: The following cases were reported: Salisbury 5, Bulawayo 4, Gwelo 8, Fort Victoria 4.

33. Biliary: Two cases were reported in the Bulawayo District.

34. Sweating Sickness: A few cases occurred in the Salisbury, Bulawayo, Umtali and Gwelo Districts.

35. Opthalmia: Is prevalent in the Salisbury and Fort Victoria Districts, with a few cases in the remaining Districts.

36. Screw Worm: Was reported in all Districts.

37. Coccidiosis: Nil.

38. Internal Parasitis: Still apparent in the Melsetter District.

39. Abortion in Pigs: An outbreak occurred in the Bulawayo District.

**Poisoning.**—

40. Veld Poisoning: Cases occurred in the Bulawayo, Gwelo and Melsetter Districts.

41. Mineral Poisoning: Deaths from Arsenical Poisoning were reported in the Salisbury, Bulawayo, Umtali, Gwelo and Melsetter Districts.
There were 50 deaths in the Salisbury District from Nitrate Poisoning. Cases of Cyanide Poisoning also occurred in the Salisbury and Bulawayo Districts, and 9 deaths in the Salisbury District, the cause of poisoning being unknown.

**Mallein Testing.**—161 head tested with negative results.

**Tuberculin Testing.**—102 head tested with one reactor which was slaughtered.

## IMPORTATION:

**Union of South Africa.**—11 bulls, 66 cows and calves (for breeding), 18 horses and mares, and 78 geldings.

**Bechuanaland Protectorate.**—2 bulls slaughtered, 170 oxen slaughtered, and 36 cows and calves slaughtered.

## EXPORTATION:

**Union of South Africa.**—1 bull, 3 horses and mares.

**Portuguese East Africa.**—10 oxen (trek), and 18 cows and calves (for breeding).

**Northern Rhodesia.**—37 donkeys and jackasses, 1 horses and mares, 2 mules, and 27 pigs (for breeding).

**Belgian Congo.**—18 pigs (for breeding).

## EXPORTATION—MISCELLANEOUS:

**United States of America.**—1,000 lbs. Ox Gall.

**Union of South Africa.**—29,343 lbs. Quarters Beef; 502 lbs. Livers; 13,037 lbs. Sausage Skins; and 1,192 lbs. Bungs.

**Bechuanaland Protectorate.**—10 lbs. Gammons; 149 lbs. Cooked Shoulders; 146 lbs. Sliced Shoulders; and 487 lbs. Smalls.

**Northern Rhodesia.**—12,389 lbs. Sides; 7,000 lbs. Middles; 123 lbs. Liverpool Rolls; 730½ lbs. Hams; 2,070½ lbs. Gammon; 37 lbs. Picnic Hams; 3,597½ lbs. Cooked Shoulders; 1,029 lbs. Sliced Shoulders; and 4,778½ lbs. Smalls.

**Belgian Congo.**—215,209 lbs. Quarters Beef; 34,603 lbs. Standard Fores; 12,057 lbs. Tripe; 5,737 lbs. Offal; and 20,201 lbs. Mutton.

## MEAT PRODUCTS FROM LIEBIGS (RHODESIA) LTD., West Nicholson:

**Belgian Congo.**—67,680 lbs. Corned Beef.

**Union of South Africa.**—161,100 lbs. Corned Beef; 13,500 lbs. Oxford Sausages; 16,626 lbs. Vienna Sausages; 1,650 lbs. Liver Roll; 9,600 lbs. Steak and Kidney; 6,000 lbs. Braised Steak; 9,600 lbs. Braised Steak and Onions; 8,400 lbs. Curried Beef; and 3,000 lbs. Potted Meat.

J. S. ADAMSON,
Acting Director of Veterinary Services.

# Rhodesian Milk Records

## OFFICIAL MILK RECORDS.

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Schoongezicht milk-chocolate | Jersey | 2 years | 6585.00 | 328.81 | 4.99 | 288 | M. W. Burras, Hertford Farm, Box 443, Bulawayo. |
| Dalham Gertie | Jersey | Jun. 3 years | 7550.50 | 392.33 | 5.20 | 300 | F. Gebbie, South Lawn, P.B. 42, Marandellas. |
| Dalham Bella | Jersey | Mature | 5924.50 | 260.21 | 4.39 | 278 | S. Gelman, 27, Baxendale St., Bulawayo. |
| Dalham Louisa | Jersey | Sen. 4 years | 7044.50* | 386.66 | 5.49 | 300 | |
| Matopo Sunbeam | Red Poll | Mature | 7699.80 | 260.66 | 3.39 | 300 | Government Experiment Station, P.B. 19K, Bulawayo. |
| Meadows Lotus | Jersey | Sen. 4 years | 6729.50 | 333.87 | 4.96 | 300 | J. H. Keightley, Moorfields, Glendale. |
| Meadows Pioneer's Daydream | Jersey | Sen. 4 years | 4877.50 | 266.28 | 5.46 | 300 | |
| Msasa Ann | Jersey | Jun. 3 years | 4999.00 | 273.35 | 5.47 | 300 | |
| Msasa Lottie | Jersey | Jun. 3 years | 5695.50 | 250.74 | 4.23 | 270 | |
| Whinburn Amber | Friesland | Mature | 8660.60 | 288.17 | 3.33 | 300 | Major R. R. Sharp, Whinburn, Redbank, Bulawayo. |
| Whinburn Amulet | Friesland | Mature | 11508.30 | 447.67 | 3.89 | 300 | |
| Whinburn Answer | Friesland | Mature | 12969.00 | 454.27 | 3.50 | 300 | |
| Whinburn Blossom | Friesland | Sen. 4 years | 9789.10 | 316.91 | 3.24 | 300 | |
| Whinburn Bluster | Friesland | Sen. 4 years | 8397.20 | 287.92 | 3.43 | 300 | |
| Whinburn Cherry | Friesland | Jun. 3 years | 8916.70 | 285.75 | 3.20 | 300 | |
| Whinburn Chocolate | Friesland | Mature | 8412.10 | 288.08 | 3.42 | 256 | |
| Whinburn Crocus | Friesland | Sen. 3 years | 7276.10 | 243.35 | 3.34 | 291 | |
| Whinburn Puffin | Friesland | Mature | 13036.80 | 440.75 | 3.38 | 277 | |

## SEMI-OFFICIAL MILK RECORDS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fairseat Oxford Queen | P.B. Jersey | 3 years | 4560.60 | 237.68 | 5.21 | 300 | Lord Acton, M'bebi, Mazoe. |
| Gwentham Vanilla's Vanity | P.B. Jersey | 4 years | 6736.90 | 298.82 | 4.44 | 300 | |
| Bromley | G. Friesland | Mature | 9011.10 | 297.16 | 3.30 | 281 | D. A. Allan, Doctors Gift, P.O. Theydon. |
| Bulawayo | G. Friesland | Mature | 10447.40 | 347.77 | 3.33 | 300 | |
| Jenny | G. Friesland | Mature | 8078.80 | 282.45 | 3.50 | 300 | |
| Sinola | G. Friesland | Mature | 9094.30 | 311.64 | 3.43 | 300 | |
| Mabel | G. Friesland | Mature | 8790.10 | 278.19 | 3.16 | 300 | Mrs. M. Allan, Doctors Gift, P.O. Theydon. |
| Peggy | G. Friesland | 4 years | 8083.90 | 269.46 | 3.33 | 300 | |
| Susa | G. Friesland | 4 years | 10097.10 | 326.94 | 3.24 | 300 | |
| Herra | G. Friesland | 2 years | 6990.80 | 253.43 | 3.62 | 270 | B. M. Atkinson, P.O. Box 1404, Salisbury. |
| Katerina | G. Friesland | 2 years | 8732.10 | 357.18 | 4.09 | 300 | |
| Lavinia | G. Friesland | 2 years | 6084.70 | 254.19 | 4.18 | 300 | |
| Noni | G. Friesland | 2 years | 9327.30 | 303.28 | 3.25 | 278 | |
| Polly | G. Friesland | 2 years | 7273.60 | 236.64 | 3.25 | 254 | |
| Winnifred | G. Friesland | 2 years | 6651.10 | 230.51 | 3.46 | 257 | |
| Ynyr | G. Friesland | 2 years | 6213.90 | 234.95 | 3.62 | 245 | |
| No. 19 | G. Friesland | Mature | 7026.10 | 245.04 | 3.49 | 300 | C. A. Austen, Box 115, Que Que. |
| Cecil Rhodes | G. Friesland | Mature | 7641.00 | 297.78 | 3.90 | 300 | R. A. Ballantyne, P.O. Box 801, Salisbury. |
| Chicken | G. Friesland | Mature | 6665.00 | 248.77 | 3.73 | 300 | |
| Dancing Lass | G. Friesland | Mature | 5981.00 | 238.66 | 3.99 | 300 | |
| Famous | G. Friesland | Mature | 7517.40 | 236.00 | 3.14 | 300 | N. G. Barrett, Gavenny, P.O. Box 38, Rusape. |
| Panne | G. Friesland | Mature | 7043.90 | 235.96 | 3.35 | 300 | |
| Charter | G. Shorthorn | 4 years | 7818.80 | 288.81 | 3.69 | 300 | F. J. Barry, Umtassa, Box 209, Umtali. |
| Dairy III | G. Shorthorn | Mature | 6811.50 | 280.33 | 4.12 | 300 | |
| Daisy | G. Shorthorn | 3 years | 6709.50 | 287.16 | 4.29 | 287 | |
| Jennifer II | G. Shorthorn | Mature | 7491.60 | 261.22 | 3.49 | 300 | |
| Josie | G. Shorthorn | Mature | 7052.00 | 323.76 | 4.59 | 300 | |
| Monica | G. Shorthorn | Mature | 11843.50 | 477.81 | 4.03 | 300 | |
| Mary | G. Shorthorn | Mature | 7084.30 | 316.79 | 4.47 | 300 | J. H. Barry, En Avant, P.B. Umtali. |

### SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Maypain | G. Friesland | 4 years | 7107.30 | 276.93 | 3.90 | 300 | J. A. Baxter, Glen Norah, Box 1368, Salisbury. |
| Porthole | G. Friesland | 3 years | 7693.80 | 265.63 | 3.45 | 300 | |
| Union | G. Friesland | Mature | 6651.10 | 251.80 | 3.79 | 283 | |
| 15% | G. Friesland | 4 years | 7040.00 | 232.61 | 3.30 | 300 | |
| Penny | G. Guernsey | 4 years | 5621.20 | 256.39 | 4.56 | 266 | J. R. Bedford, Poltimore, Marandellas. |
| D.72 | G. Friesland | Mature | 8206.20 | 263.27 | 3.21 | 289 | A. L. Bickle, Box 595, Bulawayo. |
| D.99 | G. Friesland | Mature | 10048.20 | 326.46 | 3.25 | 300 | |
| D.127 | G. Friesland | Mature | 9068.90 | 303.87 | 3.35 | 300 | |
| D.134 | G. Friesland | Mature | 8400.00 | 272.58 | 3.25 | 260 | |
| D.201 | G. Friesland | 4 years | 7771.30 | 243.48 | 3.13 | 300 | |
| D.186 | G. Friesland | Mature | 7474.90 | 254.09 | 3.43 | 300 | |
| D.218 | G. Friesland | 4 years | 9512.20 | 294.05 | 3.09 | 300 | |
| D.243 | G. Friesland | 3 years | 7183.40 | 283.55 | 3.95 | 300 | |
| D.255 | G. Friesland | 3 years | 6993.30 | 236.07 | 3.37 | 300 | |
| D.270 | G. Friesland | 2 years | 6988.50 | 229.45 | 3.29 | 300 | |
| Susie | G. Friesland | Mature | 8776.50 | 289.72 | 3.30 | 300 | Bothashof School, P.B. 164H, Salisbury. |
| Dirko Swart Kapel | P.B. Friesland | Mature | 7898.00 | 308.47 | 3.91 | 292 | C. Boyd Clark, Mount Zonga, Inyazura. |
| No. 188 | G. Friesland | Mature | 8892.00 | 304.09 | 3.42 | 300 | |
| No. 190 | G. Friesland | Mature | 6798.00 | 226.82 | 3.34 | 300 | |
| No. 233 | G. Friesland | Mature | 6924.00 | 257.00 | 3.71 | 300 | |
| No. 349 | G. Friesland | 4 years | 7131.00 | 245.92 | 3.45 | 290 | |
| Grove Park Airbird | G. Friesland | Mature | 8625.00 | 269.78 | 3.13 | 267 | Bradley Bros., P.O. Box 699, Bulawayo. |
| Grove Park Dreamer | G. Friesland | Mature | 8737.00 | 302.27 | 3.46 | 300 | |
| Grove Park Eva | G. Friesland | Mature | 7916.00 | 292.55 | 3.82 | 300 | |
| Grove Park Hester | G. Friesland | Mature | 9703.00 | 327.68 | 3.38 | 300 | |
| Grove Park June | G. Friesland | Mature | 7499.00 | 249.22 | 3.32 | 300 | |
| Grove Park Mavis | G. Friesland | 4 years | 6988.00 | 256.89 | 3.68 | 300 | |
| Grove Park Rose | G. Friesland | 4 years | 8014.00 | 277.98 | 3.47 | 300 | |
| Bella I | G. Friesland | Mature | 6270.00 | 236.50 | 3.77 | 300 | Miss N. Brereton, Coolmoreen, Gwelo. |
| Betty | G. Guernsey | Mature | 6162.00 | 258.35 | 4.19 | 285 | |
| Kathleen | G. Friesland | 4 years | 6360.00 | 231.42 | 3.64 | 300 | |
| Meg | G. Friesland | Mature | 7502.00 | 265.17 | 3.53 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Chance | G. Friesland | Mature | 6469.50 | 242.33 | 3.75 | 300 | B.S.A. Co. Mazoe Citrus Estate, Mazoe. |
| Longone | G. Friesland | Mature | 6618.00 | 241.78 | 3.65 | 300 | |
| Plate | G. Friesland | Mature | 8942.50 | 337.10 | 3.77 | 300 | |
| Mafazi | G. Friesland | Mature | 8103.00 | 280.51 | 3.46 | 300 | |
| White II | G. Friesland | Mature | 13403.00 | 448.22 | 3.34 | 300 | |
| No. 20 | G. Friesland | Mature | 9009.30 | 289.60 | 3.21 | 300 | Col. P. A. Brooke, "Borrowdale-Homestead," P.O. Box 1690, Salisbury. |
| No. 50 | G. Friesland | 4 years | 7620.10 | 243.53 | 3.20 | 277 | Bruceham Dairy, Box 21, Fort Victoria. |
| Isobel | G. Friesland | Mature | 9649.00 | 304.70 | 3.16 | 300 | M. W. Burras, Box 443, Bulawayo. |
| June | G. Friesland | Mature | 9738.00 | 292.76 | 3.01 | 300 | |
| Sophie | G. Friesland | Mature | 8017.00 | 306.52 | 3.82 | 300 | E. Butler, Woodlands, P.O. Shamva. |
| Alice | G. Hereford | Mature | 5922.50 | 230.86 | 3.89 | 300 | L. E. O. Cary, Clovelly, P.O. Trelawney. |
| Daisy | G. Friesland | 3 years | 8416.60 | 347.68 | 4.13 | 300 | Mrs. L. Jackson Clarke, Kingston Dairy, Gwelo. |
| Star | G. Friesland | 4 years | 13245.10 | 540.12 | 4.08 | 300 | |
| No. 4 | G. Friesland | Mature | 11893.00 | 385.96 | 3.25 | 300 | Cross & Son, P.B. T.208, Bulawayo. |
| No. 11 | G. Friesland | Mature | 9886.00 | 322.55 | 3.26 | 300 | |
| No. 29 | G. Friesland | Mature | 8695.00 | 293.31 | 3.37 | 300 | |
| No. 41 | G. Friesland | Mature | 6420.00 | 230.21 | 3.59 | 286 | |
| No. 47 | G. Friesland | Mature | 9371.00 | 301.00 | 3.21 | 300 | |
| No. 62 | G. Friesland | Mature | 8432.00 | 283.83 | 3.37 | 300 | |
| No. 69 | G. Friesland | Mature | 7559.00 | 254.96 | 3.38 | 284 | |
| No. 70 | G. Friesland | Mature | 8179.00 | 253.11 | 3.09 | 300 | |
| No. 72 | G. Friesland | Mature | 7880.00 | 252.86 | 3.21 | 300 | |
| No. 74 | G. Friesland | Mature | 6899.00 | 225.87 | 3.27 | 238 | |
| No. 75 | G. Friesland | Mature | 10682.00 | 342.17 | 3.20 | 300 | |
| No. 76 | G. Friesland | Mature | 8559.00 | 324.55 | 3.79 | 300 | |
| No. 80 | G. Friesland | Mature | 8380.00 | 265.37 | 3.17 | 287 | |
| No. 84 | G. Friesland | Mature | 9288.00 | 309.71 | 3.33 | 300 | |
| No. 87 | G. Friesland | Mature | 7361.00 | 243.64 | 3.31 | 300 | |
| No. 96 | G. Friesland | Mature | 8760.00 | 279.17 | 3.20 | 300 | |
| No. 101 | G. Friesland | Mature | 9328.00 | 296.99 | 3.18 | 300 | |
| No. 118 | G. Friesland | 3 years | 8296.00 | 252.57 | 3.04 | 290 | |
| Molly | G. Friesland | 2 years | 6062.70 | 245.65 | 4.05 | 244 | J. V. Danckwerts, P.O. Box 989, Salisbury. |

## SEMI-OFFICIAL—(Continued)

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Lorna | G. Guernsey | Mature | 5428.20 | 249.11 | 4.59 | 283 | E. A. Ditcham, "Roughlands," Marandellas. |
| Phoney | G. Guernsey | Mature | 5972.50 | 236.92 | 3.97 | 283 | |
| Adolf | G. Friesland | Mature | 6053.20 | 239.43 | 3.95 | 300 | A. B. Dobson, Endeavour Farm, Norton. |
| Buttercup | G. Friesland | Mature | 8135.60 | 293.78 | 3.61 | 300 | |
| Enna | G. Friesland | Mature | 6606.40 | 230.65 | 3.49 | 300 | |
| Gradier | G. Friesland | Mature | 7578.60 | 261.17 | 3.43 | 300 | |
| Jophenia | G. Friesland | Mature | 7090.40 | 244.98 | 3.45 | 300 | |
| Lady Godiva | G. Friesland | Mature | 7159.20 | 237.86 | 3.32 | 300 | |
| Sadzi | G. Friesland | Mature | 6559.60 | 241.80 | 3.68 | 300 | |
| Jamblin | G. Friesland | Mature | 6780.00 | 245.74 | 3.62 | 300 | |
| No. 369 | G. Guernsey | Mature | 6410.50 | 265.47 | 4.14 | 282 | B. St. J. D. Downs, Safago, P.B. Gwelo |
| No. 368 | G. Guernsey | Mature | 6484.00 | 241.93 | 3.73 | 259 | |
| No. 456 | G. Guernsey | Mature | 6644.80 | 272.35 | 4.10 | 300 | |
| Beans | G. Friesland | Mature | 6389.20 | 225.65 | 3.52 | 300 | J. N. Duff, Box 3, Marandellas. |
| Jean | G. Friesland | 4 years | 5449.50 | 234.39 | 4.30 | 248 | |
| Kitten | G. Friesland | Mature | 6949.00 | 225.38 | 3.24 | 300 | |
| Marandellas | G. Friesland | Mature | 6248.00 | 248.79 | 3.98 | 300 | |
| Winnie | G. Friesland | Mature | 7169.60 | 229.46 | 3.20 | 285 | |
| Pam | G. Friesland | Mature | 6981.00 | 255.15 | 3.65 | 300 | D. M. Edwards, Box 11, Eiffel Flats. |
| Sally | G. Friesland | Mature | 7617.50 | 353.06 | 4.63 | 258 | |
| Princess Elizabeth | G. Friesland | 4 years | 9810.50 | 332.32 | 3.39 | 300 | R. I. Edwards, Box 25, Chipinga. |
| Queen Bess | G. Friesland | Mature | 9450.60 | 341.44 | 3.61 | 293 | |
| Queen Charlotte | G. Friesland | Mature | 7719.80 | 281.32 | 3.64 | 300 | |
| Queen Victoria | G. Friesland | Mature | 8211.40 | 319.33 | 3.89 | 300 | |
| Windsor Lass | G. Friesland | 4 years | 12217.30 | 439.85 | 3.60 | 300 | |
| Castlezonga Dindsay | P.B. Friesland | Mature | 6391.00 | 269.18 | 4.21 | 257 | Mrs. M. Everard, Castle Zonga, Inyazura. |
| Truant V | G. Friesland | 4 years | 7720.00 | 254.14 | 3.29 | 300 | |
| No. 176 | G. Friesland | Mature | 7962.00 | 294.13 | 3.69 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. 4 | G. Friesland | 3 years | 7502.50 | 267.08 | 3.56 | 255 | Mrs. H. C. Fischer, Olivia Farm, Headlands. |
| No. 15 | G. Friesland | 3 years | 9337.00 | 306.24 | 3.28 | 300 | |
| No. 60 | G. Friesland | Mature | 8837.50 | 305.29 | 3.57 | 300 | |
| No. 76 | G. Friesland | Mature | 12184.00 | 403.26 | 3.31 | 300 | |
| No. 129 | G. Friesland | Mature | 6028.00 | 225.26 | 3.74 | 244 | |
| No. 147 | G. Friesland | 4 years | 7922.50 | 304.16 | 3.84 | 251 | |
| No. 148 | G. Friesland | Mature | 8494.00 | 309.92 | 3.65 | 295 | |
| No. 157 | G. Friesland | Mature | 9656.50 | 291.64 | 3.02 | 300 | |
| No. 213 | G. Friesland | Mature | 7444.00 | 241.38 | 3.24 | 228 | |
| No. 246 | G. Friesland | Mature | 8651.50 | 298.15 | 3.44 | 300 | |
| No. 247 | G. Friesland | Mature | 10142.00 | 343.80 | 3.39 | 300 | |
| No. 290 | G. Friesland | Mature | 9946.50 | 345.54 | 3.47 | 278 | |
| No. 50 | G. Friesland | Mature | 7611.00 | 256.39 | 3.37 | 293 | R. Le S. Fischer, Wakefield, P.O. Headlands. |
| No. 74 | G. Friesland | Mature | 12090.00 | 430.49 | 3.56 | 300 | |
| No. 77 | G. Friesland | Mature | 6712.00 | 228.29 | 3.40 | 278 | |
| No. 93 | G. Friesland | Mature | 12722.00 | 412.80 | 3.25 | 288 | |
| No. 208 | G. Friesland | Mature | 8442.00 | 284.82 | 3.37 | 248 | |
| No. 215 | G. Friesland | 4 years | 9908.00 | 357.51 | 3.51 | 300 | |
| No. 228 | G. Friesland | 4 years | 9213.00 | 315.70 | 3.43 | 267 | |
| No. 247 | G. Friesland | 4 years | 7342.00 | 255.76 | 3.48 | 300 | |
| No. 251 | G. Friesland | 3 years | 10111.00 | 397.87 | 3.94 | 300 | |
| No. 254 | G. Friesland | 3 years | 7732.00 | 317.95 | 4.11 | 260 | |
| No. 34A. | G. Friesland | 3 years | 5968.00 | 282.32 | 4.73 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 399 | G. Friesland | Mature | 8221.00 | 291.94 | 3.55 | 300 | |
| No. 408 | G. Friesland | 4 years | 6672.00 | 257.66 | 3.87 | 300 | |
| No. 410 | G. Friesland | Mature | 8400.00 | 288.28 | 3.43 | 300 | |
| No. 411 | G. Friesland | Mature | 6431.00 | 237.68 | 3.70 | 300 | |
| No. 418 | G. Friesland | 4 years | 8104.00 | 288.68 | 3.56 | 300 | |
| No. 419 | G. Friesland | 4 years | 8240.00 | 307.53 | 3.73 | 291 | |
| No. 431 | G. Friesland | Mature | 8470.00 | 317.67 | 3.71 | 300 | |
| No. 450 | G. Friesland | Mature | 8337.00 | 321.06 | 3.85 | 288 | |
| No. 453 | G. Friesland | Mature | 10456.00 | 348.67 | 3.35 | 300 | |
| No. 459 | G. Friesland | Mature | 8242.00 | 268.86 | 3.26 | 300 | |
| No. 468 | G. Friesland | Mature | 6546.00 | 247.95 | 3.78 | 300 | |
| No. 482 | G. Friesland | Mature | 8984.00 | 377.29 | 4.20 | 300 | |
| No. 489 | G. Friesland | 4 years | 5821.00 | 238.71 | 4.10 | 300 | |
| No. 490 | G. Friesland | Mature | 8254.00 | 269.73 | 3.27 | 300 | |
| No. 507 | G. Friesland | Mature | 8010.00 | 251.51 | 3.14 | 300 | |
| No. 526 | G. Friesland | 4 years | 6242.00 | 236.13 | 3.78 | 300 | |
| No. 548 | G. Friesland | Mature | 7419.00 | 257.45 | 3.47 | 300 | |
| No. 553 | G. Friesland | Mature | 7536.00 | 270.18 | 3.59 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 563 | G. Friesland | Mature | 8206.00 | 294.49 | 3.59 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 572 | G. Friesland | 4 years | 6560.00 | 231.51 | 3.53 | 281 | |
| No. 574 | G. Friesland | Mature | 8092.00 | 295.75 | 3.65 | 300 | |
| No. 557 | G. Friesland | Mature | 8534.00 | 287.99 | 3.38 | 300 | |
| No. 577 | G. Friesland | 4 years | 7566.00 | 299.60 | 3.96 | 300 | |
| No. 578 | G. Friesland | 4 years | 7879.00 | 273.57 | 3.47 | 300 | |
| No. 581 | G. Friesland | 4 years | 6371.00 | 237.05 | 3.72 | 300 | |
| No. 587 | G. Friesland | 4 years | 7177.00 | 266.81 | 3.72 | 260 | |
| No. 589 | G. Friesland | 3 years | 5837.00 | 246.81 | 4.22 | 300 | |
| Blue Bell | G. Friesland | 4 years | 7245.80 | 347.16 | 4.79 | 300 | G. J. Franklin & Son, Box 105, Umtali. |
| Business | G. Friesland | Mature | 8406.10 | 286.87 | 3.41 | 300 | |
| June | G. Friesland | Mature | 6552.40 | 236.54 | 3.61 | 300 | |
| Kingstone | G. Friesland | Mature | 7743.80 | 295.10 | 3.20 | 295 | |
| Mina | G. Friesland | Mature | 11877.20 | 455.01 | 3.83 | 300 | |
| Piri Piri | G. Friesland | 3 years | 10274.40 | 409.94 | 3.99 | 300 | |
| Rezende | G. Friesland | 2 years | 7811.10 | 268.93 | 3.44 | 278 | |
| Shandy | G. Friesland | Mature | 8671.10 | 337.14 | 3.89 | 300 | |
| Very Nice II | G. Friesland | Mature | 6895.40 | 334.95 | 4.86 | 295 | |
| Whitehead | G. Friesland | 2 years | 9158.20 | 369.02 | 4.03 | 300 | |
| Chumdenga | G. Friesland | 4 years | 6946.80 | 229.10 | 3.30 | 300 | P. Freeland, Lingfield, Gwelo. |
| Denga Denga | G. Friesland | 4 years | 7513.80 | 243.10 | 3.24 | 300 | |
| Flo | G. Friesland | Mature | 6741.30 | 227.74 | 3.38 | 300 | |
| Gondall | G. Friesland | Mature | 7243.70 | 241.76 | 3.34 | 300 | |
| Kanda | G. Friesland | Mature | 7866.10 | 265.61 | 3.38 | 300 | |
| Mabema | G. Friesland | 4 years | 6598.80 | 234.41 | 3.55 | 300 | |
| Mafemela | G. Friesland | 3 years | 7148.10 | 253.12 | 3.54 | 300 | |
| Mawalla | G. Friesland | 3 years | 7930.30 | 287.04 | 3.65 | 300 | |
| No. 26 | G. Friesland | Mature | 7552.00 | 303.07 | 4.01 | 300 | |
| No. 29 | G. Friesland | Mature | 8387.00 | 333.60 | 3.98 | 300 | |
| No. 53 | G. Friesland | Mature | 6927.80 | 232.47 | 3.36 | 300 | |
| Inyati | G. Friesland | Mature | 5804.30 | 226.24 | 3.90 | 152 | R. J. Garvin, "Fairview," Umtali. |
| No. 21 | G. Friesland | Mature | 9078.00 | 319.74 | 3.52 | 300 | S. Gelman, 27, Baxendale St., Bulawayo. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Harriet** | G. Friesland | Mature | 8140.00 | 256.06 | 3.15 | 300 | Hon. H. V. Gibbs, Bonisa, Redbank, Bulawayo. |
| **Gwanda II** | G. Friesland | 3 years | 6830.50 | 228.81 | 3.35 | 300 | Government Demonstration Farm, Umshandige, Fort Victoria. |
| **Judy** | G. Friesland | 4 years | 9925.50 | 338.58 | 3.41 | 300 | |
| **Salisbury** | G. Friesland | Mature | 9789.00 | 322.41 | 3.29 | 300 | |
| **Wendy** | G. Friesland | 4 years | 10952.00 | 375.29 | 3.43 | 300 | |
| **No. 68** | G. Friesland | Mature | 12014.50 | 369.19 | 3.07 | 300 | |
| **No. 103** | G. Friesland | 4 years | 7853.50 | 263.48 | 3.35 | 300 | |
| **Cowslip** | G. Jersey | 2 years | 5360.50 | 301.07 | 5.61 | 300 | Government Experimental Farm, Karoi. |
| **No. 66** | G. Friesland | Mature | 12171.00 | 436.14 | 3.58 | 300 | Grasslands Experiment Stn., Marandellas |
| **No. 87** | G. Friesland | 4 years | 11241.00 | 403.80 | 3.59 | 300 | |
| **No. 112** | G. Friesland | 4 years | 8831.00 | 332.25 | 3.76 | 300 | |
| **No. 27** | G. Friesland | Mature | 8709.00 | 269.07 | 3.10 | 300 | Gwebi Govt. Farm, P.B. 76B, Salisbury. |
| **No. 29** | G. Friesland | 4 years | 12543.00 | 379.57 | 3.03 | 300 | |
| **No. 33** | G. Friesland | Mature | 10602.50 | 325.50 | 3.07 | 300 | |
| **Banjo** | G. Friesland | Mature | 8041.00 | 285.55 | 3.55 | 300 | Green Bros., "Tarvie," Guinea Fowl. |
| **Zola** | G. Friesland | Mature | 6903.00 | 236.57 | 3.43 | 300 | |
| **Anne** | G. Guernsey | Mature | 5580.80 | 240.51 | 4.31 | 277 | D. A. Harley, Harleyton, P.O. Beatrice. |
| **Audrey** | G. Guernsey | Mature | 5592.50 | 228.21 | 4.08 | 300 | |
| **Colleen** | G. Guernsey | Mature | 5745.00 | 231.19 | 4.02 | 264 | |
| **Judy II** | G. Guernsey | 4 years | 5713.10 | 272.96 | 4.78 | 244 | |
| **Marjorie** | G. Guernsey | Mature | 5856.50 | 242.52 | 4.12 | 300 | |
| **Poppy** | G. Guernsey | Mature | 5339.00 | 230.15 | 4.31 | 282 | |
| **Rosalie** | G. Guernsey | 4 years | 5592.00 | 251.13 | 4.49 | 268 | |
| **Una** | G. Guernsey | Mature | 6067.00 | 244.66 | 4.03 | 300 | |
| **Alice** | G. Friesland | 4 years | 6956.00 | 244.04 | 3.51 | 300 | D. J. Huddy, Box 718, Salisbury. |
| **Olive** | G. Friesland | Mature | 6911.50 | 277.98 | 4.02 | 300 | |
| **Pam** | G. Friesland | Mature | 10850.50 | 331.33 | 3.05 | 298 | |
| **Petal** | G. Friesland | Mature | 8140.00 | 318.90 | 3.92 | 300 | |
| **Ruby** | G. Friesland | Mature | 5794.00 | 229.10 | 3.95 | 251 | |
| **Sarah** | G. Friesland | 4 years | 7449.00 | 239.62 | 3.22 | 300 | |
| **Blom III** | G. Friesland | Mature | 6805.70 | 323.25 | 4.75 | 300 | L. Huddy, Box 924, Salisbury. |
| **Katie** | G. Friesland | 4 years | 5216.20 | 227.86 | 4.18 | 251 | |
| **June** | G. Friesland | Mature | 6492.20 | 236.42 | 3.64 | 289 | |
| **Limbe** | G. Friesland | Mature | 7972.90 | 245.78 | 3.08 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Blanche | G. L.R./Shorthorn | Mature | 5694.00 | 242.14 | 4.25 | 285 | Mrs. M. R. Huddy, P.O. Box 899, Salisbury |
| Blossom | G. Guernsey | Mature | 5372.00 | 244.19 | 4.55 | 286 | |
| Meg | G. L.R./Shorthorn | 3 years | 4909.00 | 227.19 | 4.63 | 300 | |
| Victoria | G. Friesland | 3 years | 6151.90 | 227.14 | 3.69 | 300 | Sir G. M. Huggins. Box 122, Causeway, Salisbury. |
| Blackie | G. Friesland | 4 years | 6702.00 | 262.54 | 3.91 | 300 | J. A. G. Hughes, Bains Hope, P.O. Melfort. |
| Buttercup | G. Friesland | 3 years | 7579.00 | 266.85 | 3.52 | 300 | |
| Emily | G. Friesland | Mature | 9246.50 | 308.50 | 3.33 | 300 | |
| Saturday | G. Friesland | Mature | 8377.00 | 270.75 | 3.23 | 300 | |
| J.56/1/4 | G. Friesland | 2 years | 10200.00 | 332.03 | 3.26 | 300 | J. Jamieson, Box 217, Bulawayo. |
| J.57/1 | G. Friesland | Mature | 12065.00 | 393.00 | 3.26 | 300 | |
| J.60/1/1 | G. Friesland | 3 years | 10821.00 | 386.38 | 3.57 | 300 | |
| J.61/1 | G. Friesland | Mature | 9592.00 | 290.26 | 3.03 | 300 | |
| J.61/1/1 | G. Friesland | 4 years | 11329.00 | 369.61 | 3.26 | 300 | |
| J.66/1/4 | G. Friesland | 3 years | 7287.00 | 241.21 | 3.31 | 300 | |
| J.67/3 | G. Friesland | Mature | 8627.00 | 285.34 | 3.31 | 300 | |
| J.94/1 | G. Friesland | Mature | 9307.00 | 286.73 | 3.08 | 300 | |
| J.175/4 | G. Friesland | 4 years | 11229.00 | 378.06 | 3.37 | 300 | |
| J.190/2 | G. Friesland | 4 years | 10703.00 | 351.70 | 3.29 | 300 | |
| J.197/1 | G. Friesland | 2 years | 11327.00 | 352.99 | 3.12 | 300 | |
| No. 11A. | G. Friesland | 2 years | 9012.00 | 291.19 | 3.23 | 300 | D. S. Kabot, Box 261, Bulawayo. |
| No. 36A. | G. Friesland | 3 years | 6948.00 | 238.76 | 3.44 | 300 | |
| No. 21 | G. Friesland | Mature | 6793.00 | 235.31 | 3.46 | 300 | R. G. Kay, Box 606, Bulawayo. |
| No. 27 | G. Friesland | Mature | 7420.00 | 252.50 | 3.40 | 300 | |
| No. 53 | G. Friesland | Mature | 6672.00 | 234.55 | 3.52 | 300 | |
| No. 86 | G. Friesland | Mature | 6100.00 | 226.33 | 3.71 | 300 | |
| No. 87 | G. Friesland | Mature | 7239.00 | 244.24 | 3.38 | 300 | |

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|---|---|---|---|---|---|---|---|
| No. 9 | G. Friesland | Mature | 6843.50 | 291.57 | 4.26 | 300 | B. H. Kew, Box 972, Bulawayo. |
| No. 19 | G. Friesland | Mature | 4784.20 | 234.18 | 4.89 | 290 | |
| No. D.8 | G. Friesland | Mature | 8555.60 | 291.53 | 3.41 | 300 | |
| No. K.14 | G. Friesland | Mature | 8558.40 | 288.71 | 3.37 | 300 | |
| No. K.18 | G. Friesland | Mature | 11451.20 | 423.83 | 3.70 | 300 | |
| No. K.39 | G. Friesland | 4 years | 7108.40 | 277.06 | 3.93 | 300 | |
| Bromley | G. Friesland | 2 years | 7415.00 | 301.06 | 4.06 | 282 | D. King, Rockwood Farm, Concession. |
| Doreen | G. Friesland | Mature | 6668.00 | 238.99 | 3.58 | 257 | |
| Jane II | G. Friesland | 3 years | 5347.00 | 237.36 | 4.44 | 279 | |
| Marimba | G. Friesland | Mature | 9157.00 | 326.89 | 3.57 | 292 | |
| Naomi | G. Friesland | Mature | 7641.00 | 244.76 | 3.20 | 300 | |
| Sally II | G. Friesland | Mature | 6628.00 | 246.76 | 3.72 | 261 | |
| Tib | G. Friesland | Mature | 7305.00 | 240.01 | 3.29 | 265 | |
| Violet | G. Friesland | Mature | 7136.00 | 239.40 | 3.35 | 263 | |
| Zena | G. Friesland | 3 years | 6397.00 | 238.46 | 3.57 | 292 | |
| Daisy | G. Guernsey | 3 years | 5683.90 | 237.83 | 4.18 | 300 | J. A. G. Kirstein, P.O. Box 199, Gwelo. |
| Mary | G. Guernsey | 4 years | 6413.00 | 260.91 | 4.07 | 300 | |
| Nancy | G. Guernsey | 3 years | 5955.60 | 234.37 | 3.94 | 300 | |
| Kingston Saria | G. Friesland | Mature | 9324.00 | 363.50 | 3.90 | 289 | Kingston Farm Syndicate, Box 2, Bindura. |
| Kingston Sylvia | G. Friesland | 3 years | 8696.00 | 294.34 | 3.38 | 300 | |
| Annie | G. Friesland | Mature | 5895.70 | 246.97 | 4.19 | 300 | Mrs. M. M. Krahner, Haydock Park Banket. |
| Balla Balla | G. Friesland | Mature | 6176.20 | 235.66 | 3.81 | 300 | |
| Mary | G. Friesland | Mature | 7167.10 | 233.65 | 3.26 | 300 | |
| Ivy | G. Friesland | Mature | 5321.50 | 242.74 | 4.56 | 276 | J. N. L. MacIlwaine, Box 23, Marandellas. |
| Buttercup | G. Ayrshire | Mature | 5899.00 | 237.26 | 4.02 | 300 | J. MacIntyre, Box 58, Shamva. |
| Cape | G. Jersey | Mature | 6280.00 | 261.91 | 4.17 | 300 | J. U. McCay, P.B. J181, Bulawayo. |
| Minhinick Yoga | P.B. Friesland | 3 years | 9808.00 | 381.41 | 3.89 | 300 | |
| Thibet Park Lindberg Zwartje V | P.B. Friesland | 4 years | 7832.00 | 243.47 | 3.11 | 300 | |
| No. 111 | G. Friesland | Mature | 7656.00 | 306.60 | 4.00 | 300 | |
| Bucket | G. Red Poll | Mature | 7178.70 | 301.25 | 4.20 | 300 | J. H. McLean, Box 161, Gwelo. |
| Nellie | G. Ayrshire | Mature | 7814.00 | 271.90 | 3.48 | 298 | |
| Vaseline | G. Ayrshire | Mature | 5380.00 | 227.71 | 4.23 | 295 | |
| No. 21 | G. Friesland | Mature | 7422.10 | 309.90 | 4.18 | 300 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Bless No. 7 | G. Friesland | Mature | 6316.50 | 233.33 | 3.69 | 234 | L. McLean, Divide, Gwelo. |
| Mecca | G. Friesland | Mature | 8217.00 | 249.73 | 3.04 | 274 | |
| Lopear | G. Friesland | Mature | 7130.10 | 256.48 | 3.60 | 285 | D. W. Marshall, Alderbury, Box 164, Umtali. |
| Violet | G. Friesland | Mature | 6799.30 | 242.35 | 3.56 | 300 | A. R. Matches, P.O. Box 64, Salisbury. |
| Lelia | G. Jersey | Mature | 6153.90 | 307.47 | 4.99 | 273 | Lt.-Col. C. I. F. Maynard, Melfort, P.B 112C, Salisbury. |
| Rusty | G. Jersey | 2 years | 5231.50 | 254.37 | 4.86 | 292 | |
| P.15/2 | P.B. Friesland | Mature | 8177.00 | 249.50 | 3.05 | 300 | Meikles Trust & Invest. Co., Ltd., Leachdale Farm, Shangani. |
| P.17/0 | P.B. Friesland | Mature | 8030.00 | 241.89 | 3.01 | 300 | |
| G.3/3 | G. Friesland | Mature | 7291.00 | 248.38 | 3.41 | 300 | |
| G.18/2 | G. Friesland | Mature | 6990.00 | 247.09 | 3.53 | 300 | |
| G.21/5 | G. Friesland | 4 years | 6832.00 | 238.23 | 3.49 | 300 | |
| P.12/2 | P.B. Friesland | Mature | 7257.00 | 225.50 | 3.11 | 300 | |
| P.5/3 | P.B. Friesland | Mature | 6619.00 | 227.82 | 3.44 | 300 | |
| P.23/3 | P.B. Friesland | Mature | 7261.00 | 250.00 | 3.44 | 300 | |
| G.2/1 | G. Friesland | Mature | 6934.00 | 232.90 | 3.36 | 300 | |
| G.2/2 | G. Friesland | Mature | 9777.00 | 304.58 | 3.12 | 300 | |
| G.28/3 | G. Friesland | Mature | 7312.00 | 255.17 | 3.49 | 295 | |
| Dirko Jong Bont Boumlie | P.B. Friesland | 2 years | 7270.00 | 293.91 | 4.08 | 300 | A. L. Millar, Estes Park, P.B. 28A, Salisbury. |
| Dirko Jong Klein Boumlie | P.B. Friesland | 3 years | 8228.00 | 307.20 | 3.73 | 300 | |
| Dirko Jong Kleir Roos VI | P.B. Friesland | 3 years | 6249.90 | 254.57 | 4.07 | 300 | |
| Dirko Ounool | P.B. Friesland | 2 years | 5756.00 | 236.48 | 4.11 | 300 | |
| Olive | G. Red Poll | Mature | 6805.00 | 260.30 | 3.83 | 300 | C. F. Mitchell, P.O. Box 1027, Bulawayo. |
| Bet Bet | G. Ayrshire | Mature | 7293.00 | 329.77 | 4.52 | 285 | R. L. Moffat, Ormiston, Shangani. |
| Fanny | G. Ayrshire | 4 years | 5757.00 | 235.61 | 4.09 | 265 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Royce | G. Ayrshire | Mature | 5852.00 | 257.09 | 4.39 | 300 | Com. E. L. Morant, Box 741, Salisbury. |
| Vivian | G. Ayrshire | 4 years | 6040.00 | 232.00 | 3.84 | 300 | |
| Crescent | G. Friesland | Mature | 6790.00 | 294.40 | 4.34 | 256 | C. F. S. Morkel, Two Streams, P.O. Macheke. |
| Lorna | G. Friesland | Mature | 6502.00 | 253.10 | 3.89 | 300 | |
| No. 127 | G. Friesland | Mature | 8494.00 | 273.50 | 3.22 | 300 | F. B. Morrisby, Box 36, Gwelo. |
| No. 157 | G. Friesland | Mature | 9640.00 | 302.71 | 3.14 | 296 | |
| No. 102 | G. Friesland | Mature | 7668.00 | 242.32 | 3.16 | 300 | |
| No. 138 | G. Friesland | Mature | 8088.00 | 243.77 | 3.01 | 300 | |
| No. 168 | G. Friesland | Mature | 7770.00 | 242.45 | 3.12 | 300 | |
| No. 192 | G. Friesland | Mature | 7920.00 | 258.70 | 3.27 | 300 | |
| No. 194 | G. Friesland | Mature | 7794.00 | 237.81 | 3.05 | 300 | |
| No. 196 | G. Friesland | Mature | 7660.00 | 238.52 | 3.11 | 300 | |
| Powder | G. Friesland | Mature | 7696.00 | 266.72 | 3.47 | 300 | |
| Grace | G. Friesland | Mature | 8117.60 | 319.14 | 3.94 | 300 | J. T. Mungle, Myreside, Odzi. |
| Fry | G. Friesland | 3 years | 6141.10 | 244.14 | 3.98 | 300 | |
| Ivy | G. Friesland | 3 years | 5550.60 | 226.49 | 4.08 | 300 | |
| Sophie | G. Friesland | 4 years | 7035.40 | 317.45 | 4.51 | 300 | |
| Chaluci Exwell | G. Friesland | Mature | 8342.00 | 257.84 | 3.09 | 300 | K. Norvall, Box 637, Bulawayo. |
| Lindfast Denise | P.B. Friesland | Mature | 9858.00 | 332.92 | 3.38 | 285 | |
| Iris | G. Friesland | Mature | 6945.00 | 230.26 | 3.32 | 300 | |
| Mabel | G. Friesland | Mature | 7644.00 | 252.67 | 3.31 | 279 | |
| Maisie I | G. Friesland | Mature | 6505.00 | 228.94 | 3.52 | 279 | |
| Minhinick Beaulah | P.B. Friesland | 3 years | 10043.00 | 349.21 | 3.48 | 300 | |
| Seaborough Sybil | P.B. Friesland | 2 years | 8056.00 | 253.60 | 3.15 | 285 | |
| Seaborough Kalkop | P.B. Friesland | 3 years | 11709.00 | 383.84 | 3.28 | 300 | |
| Sisi I | G. Friesland | Mature | 6654.00 | 232.96 | 3.50 | 300 | |
| Sparrow II | G. Friesland | Mature | 6018.60 | 227.72 | 3.78 | 300 | |
| Tina I | G. Friesland | Mature | 6904.00 | 232.78 | 3.37 | 300 | |
| Vegetable II | G. Friesland | Mature | 6610.00 | 241.78 | 3.65 | 300 | |
| Cape Town | G. Friesland | Mature | 7732.00 | 277.30 | 3.60 | 300 | |
| Nellie I | G. Friesland | Mature | 7707.00 | 313.55 | 4.07 | 300 | |
| Numnet | G. Friesland | Mature | 8208.00 | 267.17 | 3.26 | 300 | |
| Sausage | G. Red Poll | Mature | 8542.00 | 325.18 | 3.81 | 300 | |
| Sagoy I | G. Friesland | Mature | 7391.00 | 264.14 | 3.57 | 300 | |
| No. 3 | G. Friesland | 4 years | 5613.00 | 237.57 | 4.23 | 300 | P. Odendaal, Whittington, Box 4, Chipinga. |
| No. 80 | G. Friesland | 4 years | 5577.00 | 229.65 | 4.12 | 300 | |
| No. 117 | G. Friesland | 3 years | 6233.00 | 240.92 | 3.89 | 274 | |

## SEMI-OFFICIAL—(Continued).

| Name of Cow. | Breed. | Age. | Milk in lbs. | B. Fat in lbs. | Average % B. Fat. | No. of Days. | Name and Address of Owner. |
|---|---|---|---|---|---|---|---|
| Bell | G. Friesland | Mature | 7987.30 | 293.76 | 3.68 | 271 | E. Palmer, Ferndale, Penhalonga. |
| Bell II | G. Shorthorn | Mature | 8092.90 | 352.47 | 4.36 | 300 | |
| Blackie II | G. L.R./Shorthorn | Mature | 7561.60 | 275.36 | 3.64 | 244 | |
| Kettelan II | G. L.R./Shorthorn | Mature | 7479.10 | 288.57 | 3.86 | 232 | |
| Sally | G. L.R./Shorthorn | Mature | 5954.90 | 231.76 | 3.89 | 237 | |
| Sheila III | G. Friesland | 2 years | 8162.00 | 282.47 | 3.46 | 300 | |
| Helen II | G. Friesland | 2 years | 8576.30 | 311.72 | 3.63 | 261 | |
| Petal III | G. Friesland | 23 months | 6089.30 | 235.48 | 3.87 | 290 | |
| No. 3 | G. Friesland | 3 years | 7624.10 | 264.95 | 3.48 | 262 | |
| Daisy | G. Friesland | Mature | 8487.40 | 339.76 | 4.03 | 243 | |
| Jenny | G. Friesland | Mature | 10584.20 | 405.19 | 3.83 | 289 | |
| Ada | G. Jersey | Mature | 7378.50 | 236.37 | 3.20 | 300 | Mrs. M. Parsons, P.O. Box 7, Bulawayo. |
| Freda | G. Friesland | 2 years | 7825.50 | 293.74 | 3.75 | 300 | |
| Poemisa | G. Friesland | 2 years | 6861.00 | 258.71 | 3.77 | 274 | |
| Spokes | G. Friesland | Mature | 10504.90 | 315.81 | 3.01 | 300 | |
| Susie | G. Friesland | 4 years | 10575.00 | 337.08 | 3.18 | 300 | |
| Cynthia | G. Friesland | 3 years | 9137.00 | 279.95 | 3.06 | 300 | |
| Dinah | G. Friesland | Mature | 6459.00 | 236.57 | 3.66 | 165 | |
| Mac | G. Friesland | 3 years | 9908.00 | 312.75 | 3.16 | 300 | |
| Nash | G. Friesland | Mature | 11641.00 | 369.28 | 3.17 | 300 | |
| Torch | G. Friesland | Mature | 15696.00 | 574.32 | 3.66 | 300 | |
| No. 96A | G. Friesland | Mature | 6411.00 | 225.96 | 3.52 | 300 | T. C. Pascoe, P.O. Box 1253, Salisbury. |
| No. 5 | G. Jersey | 3 years | 4110.70 | 296.31 | 7.21 | 300 | H. Pretorius, Eureka, Macheke. |
| Bettafit | G. Friesland | Mature | 8395.50 | 298.39 | 3.56 | 300 | Red Valley Estate, Lushington, Marandellas. |
| Mauure I | G. Friesland | Mature | 8744.10 | 328.41 | 3.76 | 300 | |
| Rhodesia | G. Friesland | Mature | 6589.00 | 253.59 | 3.86 | 279 | G. W. Robinson, Marimba Farm, Box 346, Salisbury. |
| Simbe | G. Friesland | 4 years | 6330.60 | 242.43 | 3.83 | 273 | |
| Danga | G. Friesland | Mature | 6664.90 | 229.89 | 3.45 | 300 | Mrs. M. Rogers, Bickford, Gwelo. |
| Meallies | G. Friesland | Mature | 6392.30 | 240.96 | 3.77 | 300 | |
| Victoria | G. Friesland | Mature | 6803.60 | 274.16 | 4.03 | 300 | |

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|---|---|---|---|---|---|---|---|
| Jesitara | G. Friesland | 3 years | 6412.60 | 235.42 | 3.67 | 300 | W. F. H. Scutt, Maple Leaf, Norton. |
| Luben | G. Friesland | Mature | 9229.90 | 327.62 | 3.54 | 300 | |
| Maswina | G. Friesland | Mature | 6448.40 | 265.88 | 4.12 | 300 | |
| Poppy | G. Friesland | Mature | 8249.80 | 328.73 | 3.98 | 300 | |
| Lynmouth Fairyflower Ideal | P.B. Jersey | 3 years | 4217.60 | 225.32 | 5.34 | 269 | S. M. Sinclair, Albany, P.B. Melsetter. |
| Mukunyadza | G. Ayrshire | Mature | 5987.90 | 229.65 | 3.84 | 252 | |
| Katie | G. Friesland | Mature | 6411.00 | 265.45 | 4.01 | 300 | F. Squires, P.O. Box 1052, Salisbury. |
| Battle Fairy I | P.B. Ayrshire | Mature | 7795.00 | 300.93 | 3.86 | 300 | J. R. Stewart & Sons, Ltd., Battle Farm. P.O. Shangani. |
| Chia | G. Red Poll | Mature | 5671.80 | 232.63 | 4.10 | 300 | H. Stobart, Atlanta, Arcturus. |
| Katherine | G. Friesland | Mature | 5190.70 | 263.30 | 5.07 | 273 | |
| Sybil | G. Friesland | Mature | 5961.00 | 262.21 | 4.39 | 300 | |
| Cup | G. Friesland | Mature | 8169.20 | 259.52 | 3.18 | 300 | H. Swaine, Box 131, Gwelo. |
| Gando | G. Friesland | Mature | 6584.20 | 229.02 | 3.48 | 300 | |
| Button | G. Friesland | Mature | 13336.00 | 494.92 | 3.71 | 300 | E. Tapson Trust, Ltd., Lesapi Falls. Rusape. |
| Maggie | G. Friesland | Mature | 10526.00 | 340.84 | 3.24 | 300 | |
| Majuta | G. Friesland | Mature | 8925.00 | 337.77 | 3.78 | 300 | |
| Pickup | G. Friesland | 3 years | 7169.00 | 265.90 | 3.71 | 285 | |
| Rhoda II | G. Friesland | 2 years | 7576.00 | 308.74 | 4.08 | 295 | |
| Rose | G. Friesland | Mature | 10708.00 | 354.81 | 3.31 | 279 | |
| Tshabani | G. Friesland | Mature | 9116.00 | 285.92 | 3.14 | 289 | |
| Cousins II | G. Friesland | Mature | 8990.50 | 320.50 | 3.68 | 300 | L. Taylor, Box 55, Selukwe. |
| Hamba Lala | G. Friesland | Mature | 7484.60 | 263.60 | 3.53 | 300 | |
| Hester | G. Friesland | 4 years | 7398.50 | 287.34 | 3.88 | 300 | |
| Hotel | G. Friesland | Mature | 6395.80 | 251.63 | 3.39 | 288 | |
| January | G. Friesland | Mature | 6353.70 | 231.32 | 3.64 | 277 | |
| Mapepa | G. Friesland | Mature | 8021.30 | 273.34 | 3.41 | 300 | |
| Nyumbe | G. Red Poll | Mature | 7495.90 | 315.39 | 4.15 | 289 | |
| Training Camp | G. Friesland | Mature | 6657.50 | 231.20 | 3.47 | 300 | |
| Zomba | G. Friesland | Mature | 5362.60 | 236.95 | 4.42 | 273 | |
| Surum | G. Friesland | Mature | 7794.50 | 250.68 | 3.22 | 280 | |

## SEMI-OFFICIAL—(Continued).

| Name of Cow. | Breed. | Age. | Milk in lbs. | B. Fat in lbs. | Average % B. Fat. | No. of Days. | Name and Address of Owner. |
|---|---|---|---|---|---|---|---|
| Betty | G. Friesland | Mature | 8414.00 | 285.87 | 3.40 | 300 | A. W. Tennent, Kelvin, Headlands. |
| Cissy | G. Friesland | Mature | 7304.30 | 255.17 | 3.50 | 248 | |
| Ghenna | G. Friesland | Mature | 7837.80 | 304.51 | 3.89 | 300 | |
| Sarah | G. Friesland | Mature | 8014.90 | 266.87 | 3.33 | 280 | |
| Susan | G. Friesland | Mature | 7394.60 | 275.07 | 3.72 | 278 | |
| Tilly | G. Friesland | Mature | 7672.60 | 275.48 | 3.59 | 290 | |
| Una | G. Friesland | Mature | 6645.40 | 239.32 | 3.61 | 276 | |
| No. 7 | G. Friesland | Mature | 8156.40 | 292.47 | 3.59 | 300 | |
| No. 55 | G. Friesland | 4 years | 6538.60 | 230.97 | 3.53 | 253 | |
| No. 56 | G. Friesland | 4 years | 6334.00 | 246.84 | 3.90 | 271 | |
| No. 65 | G. Friesland | 3 years | 6684.00 | 227.18 | 3.40 | 300 | |
| Daisy | G. Red Poll | Mature | 6559.70 | 226.53 | 3.45 | 300 | J. G. Thurlow, Atherstone, Bindura. |
| Norton | G. Red Poll | Mature | 6764.60 | 255.98 | 3.79 | 300 | |
| Red Leaf Amour | P.B. Red Poll | 4 years | 6231.20 | 226.17 | 3.63 | 300 | |
| Norta II | G. Red Poll | Mature | 7019.20 | 278.37 | 3.97 | 300 | |
| Buttercup | G. Friesland | Mature | 8179.10 | 302.72 | 3.71 | 300 | Mrs. M. Turnbull, Box 479, Bulawayo. |
| Meg | G. Friesland | 4 years | 6359.90 | 269.52 | 4.24 | 300 | |
| Annie | G. Friesland | Mature | 10468.60 | 330.57 | 3.16 | 300 | |
| Lightfoot | G. Friesland | 2 years | 6741.20 | 227.62 | 3.38 | 300 | |
| Dewdrop | G. Friesland | Mature | 7260.00 | 285.80 | 3.94 | 300 | Miss van Niekerk, "Claremont," Inyanga. P.B. Rusape. |
| Jenepher | G. Friesland | 4 years | 7278.50 | 241.98 | 3.32 | 273 | |
| Mere Poppy | G. Friesland | Mature | 7101.00 | 247.10 | 3.48 | 300 | R. O. Waldschutz, Mere Farm, Box 27, Marandellas. |
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# NOTICE

## HORSESICKNESS INOCULATION.

Horsesickness Inoculation.—Vaccine for the inoculation of horses and mules of any age against horsesickness will be issued from now onwards until the end of November at a cost of 6s. per dose post free.

Immunity does not reach its height until some months after inoculation, and owners are therefore urged not to defer inoculation until the end of the season.

The vaccine must be used within seven (7) days of its despatch from the Laboratory, and will be issued direct to applicants who will be required to do or arrange for the inoculation themselves.

Directions for use will be supplied with the vaccine.

Applications, in writing, and enclosing the cash remittance, should be made to the Assistant Director of Veterinary Services (Research), P.O. Box 101, Causeway, Salisbury.

Orders will be dealt with strictly in rotation and according to supplies which may be available at the time.

Applications will neither be acknowledged nor considered unless they are accompanied by cash (6s. per dose) and received by the 30th November, 1950.

*Horsesickness Vaccine.*

Price: 6s. per dose.
Closing date for applications: 30th November.
Inoculate now.
Use within one week of its issue.

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THE RHODESIA

Agricultural Journal

Vol. XLVII. No. 5 September-October, 1950.

# Editorial

## Notes and Comments

### ROTHAMSTED EXPERIMENTAL STATION REPORT, 1949.

This Report is obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, England; price 5s. (foreign postage extra).

Included in this publication are the various Departmental Reports and details of the further work done on the Soil Survey of England and Wales. Work done in this connection has been confined to the areas reported on in the 1948 Report.

Two Special Reviews are published in the Report: (1) The Nutritional Problems in Forest Nurseries, and (2) The Relation between Soil Cultivation and Crop Yields.

A list of the Departmental Publications is given as well as the Publications of the Rothamsted Experimental Station.

### MUSHROOM-GROWING AND MUSHROOM INSECTS AND THEIR CONTROL.

This comprehensive Bulletin, written by Miss A. M. Bottomley and Dr. Bernard Smit, is obtainable from the Government Printer, Pretoria (Bulletin No. 210; price 1s.)

Miss Bottomley discusses the essential requirements for the successful cultivation of mushrooms, namely:—

(1) Fresh, good quality "pure culture" spawn from a reliable firm.

(2) Good, fresh manure from vigorous horses which are grain-fed and bedded on straw (preferably wheat straw).

(3) A suitable place in which to grow the mushrooms, where the necessary temperature, humidity and ventilation can be obtained and maintained.

The bulletin is well illustrated and contains diagrams of suitable mushroom houses, mushroom beds, etc. Full details on the production and marketing of the crop are also given.

In Section III Dr. Bernard Smit stresses the importance of absolute cleanliness during all stages of production, as mushrooms are susceptible to attack by insects and fungi. Control measures for these are given. Some simple recipes for cooking mushrooms, along with a table of their food value compared with other foods, are included in the Bulletin.

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## A DESCRIPTIVE LIST OF PLANT DISEASES IN SOUTHERN RHODESIA and LIST OF BACTERIA AND FUNGI,

by
J. C. F. HOPKINS, D.Sc. (Lond.), A.I.C.T.A.,
Chief Botanist and Plant Pathologist.

[Memoir No. 2 (revised 2nd Edition), Department of Agriculture, Salisbury; available at Government Stationery Office, Salisbury; price 4s.]

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## RETIREMENT OF Mr. D. D. BROWN.

One of the well-known personalities of the Department of Agriculture, Mr. D. D. Brown, retired recently.

In the middle of 1921 Mr. Brown arrived in Salisbury to take up duty as Assistant Tobacco and Cotton Expert.

Mr. Brown's activities in the earlier years included lecture tours and advisory work connected with both cotton and tobacco, and he also paved the way for the development of sugar growing.

As from 1930 his official designation was changed to Chief Tobacco Officer, and his duties were confined to matters pertaining to tobacco growing and marketing. He opened several tobacco experiment stations, the last being the Cigar Tobacco Experiment Station at Chipinga.

We wish Mr. Brown many happy years of well-earned retirement.

# Some Notes on Freshwater Fishes in Southern Rhodesia

## PART V.

By R. A. JUBB, B.Sc.

*Tilapia sparmanni.* Banded Cichlid. There are numerous species of the Family Cichlidae which do not grow to much more than six inches in length; this is one of them. Fresh from the water this fish is silvery green, darker on the back with seven to nine vertical bands. The dorsal fin is edged with pink and a distinctive feature is a black spot at the base of the beginning of the soft portion of the fin. The tail is truncate or slightly rounded. The irridescent colourings and the smallness of this fish make it a popular aquarium species. Getting down to harder facts of life, it is also recommended and bred as forage food for predatory species. During the breeding season the bars become very dark, almost black, and brooding pairs can easily be detected about a foot below the surface in clear water amongst the water lilies. The fry are minute, but can usually be spotted when the shoal moves.

*Tilapia sparmanni* is not a mouth breeder. Mr. S. S. du Plessis,* of the Jonkershoek Inland Fisheries Department, has studied its breeding habits and he writes as follows:—

"At Jonkershoek the breeding of *Tilapia sparmanni* commences in October, when the water temperature rises above 60°F. The dark coloured, elongated eggs are laid on stones, roots and stems of aquatic plants, or on the hard pond bottom. Both parents guard the eggs, but the female is more active than her mate. As they hatch, the young are picked up in the mouth and deposited in a small pit which has previously been constructed in the pond bottom. Using a series of three pits, one pair was seen to shift the young from one to the other about once every 24 hours.

"In the pits their tails are in constant vibration to ensure circulation of the water. At the back of the head is a marked prominence formed by two pairs of cup-shaped glands which secrete a colourless, sticky substance. This enables the little fish to anchor itself to the bottom of the pit. This is necessary on account of the constantly vibrating tail. When the small fish starts swimming these glands disappear.

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*Observations on the Habits of *Tilapia sparmanni*. S. S. du Plessis, M.Sc. Inland Fisheries Department Report No. 2.

"After they leave the pit the young fish swim about in a shoal guarded by both parents, whose markings now become more distinct. When danger threatens, the parents give the sign to the fry by sudden jerks of the body which sends them to the bottom, where they swim around apparently unconcerned. When the parents leave them to chase off enemies, the whole shoal rotates in a characteristic fashion, keeping close to the bottom."

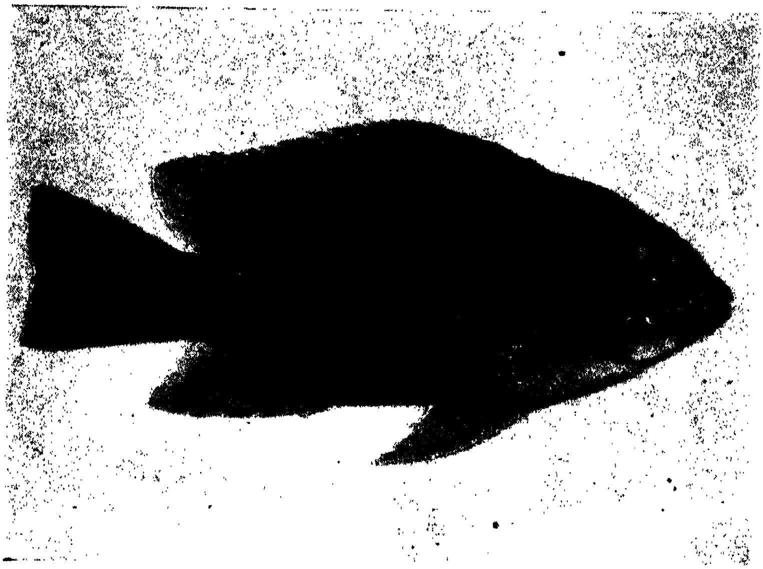
Preserved in formalin there is a great similarity between young *Tilapia melanopleura* and *Tilapia sparmanni*, even to the dark spot on the dorsal fin and the gill-raker count. Freshly caught, *T. melanopleura* have a characteristic pink flush on the throat and belly.

*Marcusenius discorhynchus.* This species, another of the Family Mormyridae which consists of queer types such as the "Bottlenose" and "Cornish Jack," does not grow to much beyond eight inches in length. Its natural colour is silvery yellow; the blotches seen in the photograph developed after the specimen was put into formalin. The scales, like those of the rest of the family, are very small. This species is common to the Zambesi River system and the rivers and lakes of Central Africa and is netted in large numbers, gutted and smoked for African consumption.

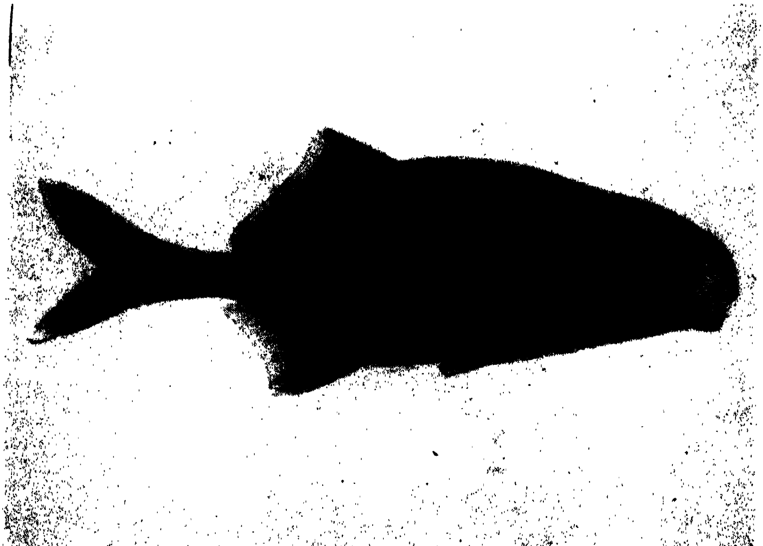
*Schilbe mystus.* Silver Barbel. This small barbel-like fish belongs to the Family Schilbedae, and although common to the Zambesi River system, has not been found south of it. In length it does not exceed 12 inches and is very light in colour with a broad darkish lateral band; there are no scales. The droop of the tail is characteristic. Although small, this fish is of great food value and is eagerly sought after by Africans for its fat. A closely resembling species of the same family is *Eutropius depressirostris*, which is found in rivers as far south as in the Transvaal; this latter species has an adipose dorsal fin and can therefore be distinguished quite easily from species of Schilbe.

*Distichodus mossambicus.* This fish is a member of the Family Characinidae, and, although there is no resemblance, is a relative of the "Tiger-fish." Its habitat is the Zambesi River, particularly the Victoria Falls area, where specimens of up to 3½ lb. have been caught. In shape the fish is very deep and even the largest do not exceed 12 inches in length. Fresh from the water it is silvery yellow in colour with a blueish sheen along the back and partly down the sides forming vertical bands. The fins are pale yellow and the forked tail has a dark edging to the inner portion of the lobes. Characteristic features are the very small scales and the adipose dorsal fin.

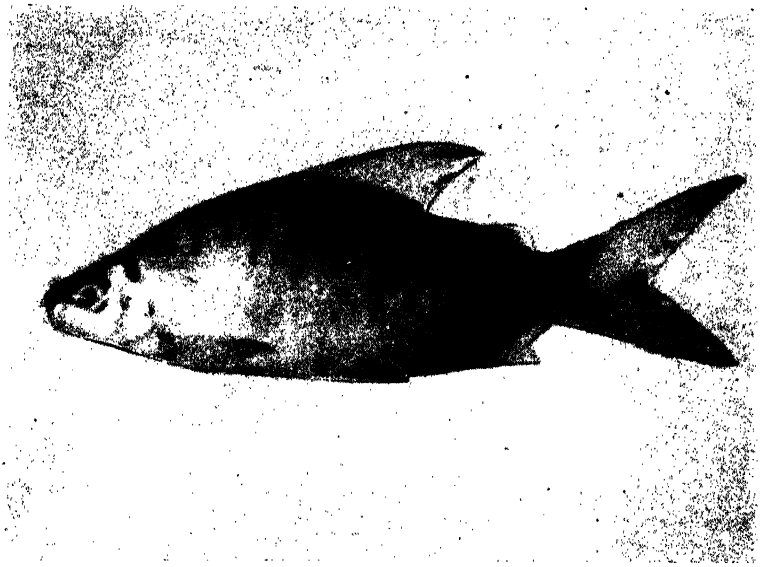
*Labeo cylindricus.* Mud-sucker. A widely distributed species of the family Cyprinidae, the genus owes its name to the well-developed lips which are a characteristic of the species. The mouth is described as inferior and the lips form a sucker with



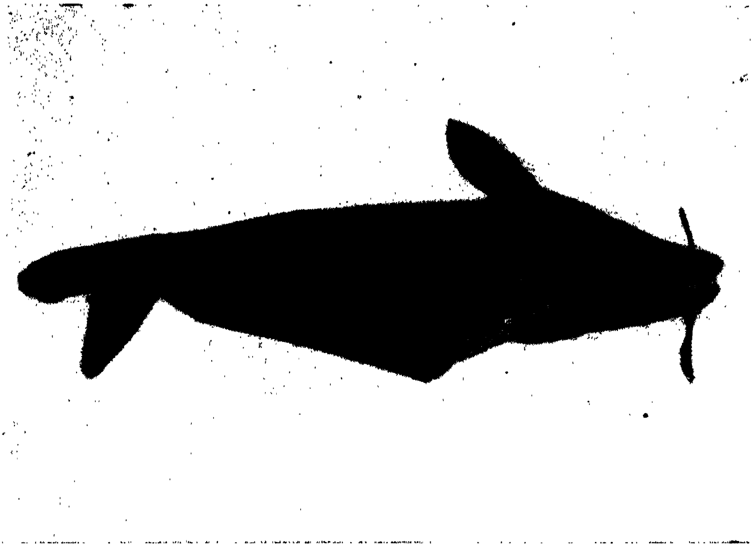
Banded Cichlid (*Tilapia sparmanni*).



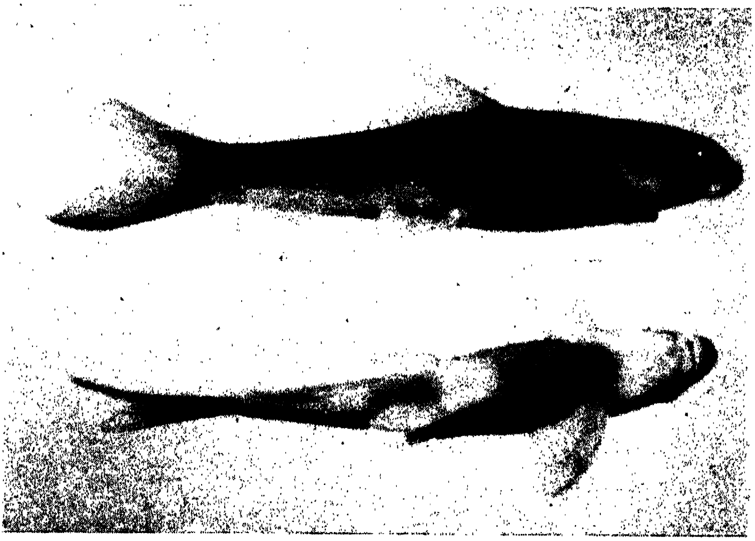
***Marcusenius discorhynchus.***



*Distichodus mossambicus.*



Silver Barbel. (*Schilbe mystus*).



Mud-sucker. (*Labeo cylindricus*).

which the fish dredges the muddy bottom and sides of rocks for food. This sucker-like mouth is also used for clinging to rocks when the fish migrates up stream against strong currents; it is this species that fights its way up the Prince Edward Dam wall against the water that sweeps so many other fish back. In colour it is slate grey on the back with light belly; the scales are large.

Although this particular species does not grow to much more than 12 inches in length, some members of the genus, when mature, are much larger. The "Gorge Fish," *Labeo altivelis*, which is caught below the Falls and, incidentally, in the Hunyani River, where it is known as "Hunyani Salmon," runs to about 7 lb. in weight.

# Subsoiling in Relation to Agriculture

By K. J. MACKENZIE, Senior Extension Officer, and
R. M. M. CORMACK, Senior Conservation Enquirer,
Department of Conservation and Extension, Southern Rhodesia.

### Descriptive.

The agricultural operation known as subsoiling or chiselling consists of dragging a heavy rigid tine implement through the soil so that it penetrates and shatters the surface and subsoil to as much as 24 inches.

### Depth.

Subsoiling is a tough and expensive job, the cost depending largely on the depth of penetration, consequently this would be limited to just the depth that is required to attain the desired result.

If the purpose of the subsoiling is to increase penetration and absorption as much as possible, either for the purpose of storing water, or to improve downward drainage, then penetration would be as deep as possible.

If, on the other hand, the purpose was to shatter plough or natural pan, little advantage would be gained by going deeper than the pan, and nine to twelve inches penetration might do as much good as 24 inches at a cost of only half as much.

To decide what depth is justified it would be logical to sink a few test holes, so that the soil horizons could be examined to determine just whether subsoiling is necessary, secondly how deep this should be, and thirdly whether the soil is in such condition that the maximum fracturing effect will be obtained.

### Uses of Subsoiling.

In areas where rainfall is the limiting factor, it is probable that subsoiling would increase the penetration and therefore the water holding capacity of soils considerably where conditions were suitable. Little experimental work has yet been carried out on these lines, but one series in U.S.A. showed that a 20-minute rain of .65 inches penetrated to from 20 to 50 inches on subsoiled land and not more than 12 to 14 inches on untreated land.

1. It may be assumed therefore that in areas of lower rainfall it would enable plants to make the greatest possible use of the rainfall, and to withstand the maximum amount of drought by deeper rooting.

2. In areas of high rainfall, particularly where soils have an impervious layer near the surface, due to plough pan or natural

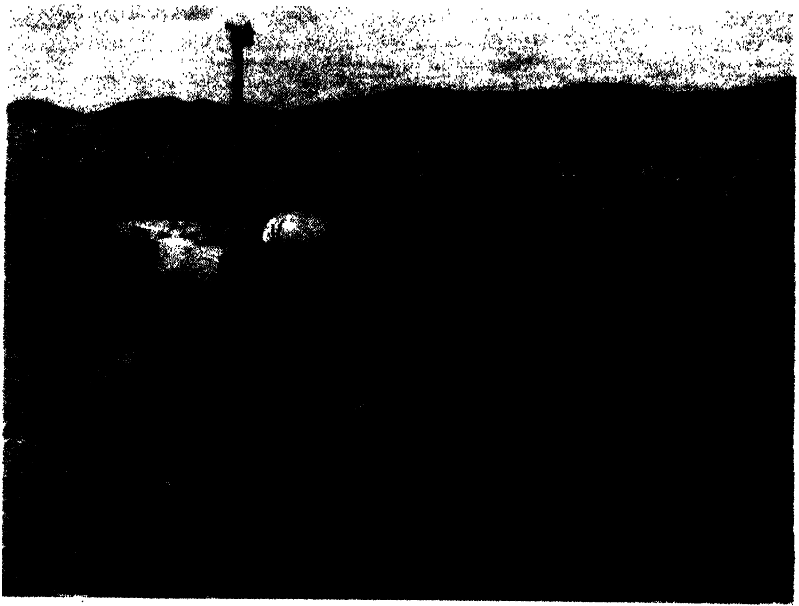


Figure 1.—A good example of a balanced unit of the tool bar type.

Figure 2.—Note the good shattering effect and the bulge in the soil indicating maximum effect below.

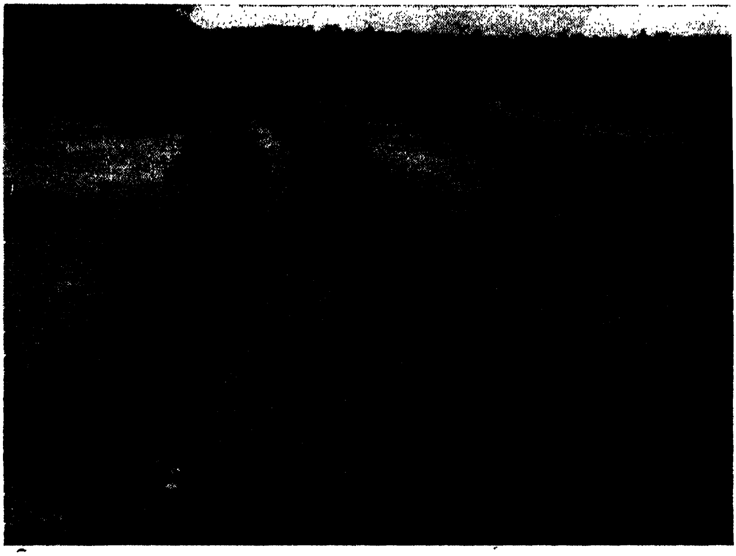


Figure 3.—Denuded grazing land after ripping. If the lines had been closer and the depth reduced results would have been better and cost the same.

Figure 4.—Grass establishing itself and spreading along the ripped lines. Each line acts as a filter strip and traps both seed and soil, while the fractured sub-soil enables plants to resist drought by penetrating deeply.

causes, or where the land surface is hard and compact, the effect would be firstly to increase the absorption of water, secondly to increase the feeding area of plant roots, and thirdly to facilitate aeration and the growth of soil bacteria.

3. It simplifies preparation of the land by loosening up compacted soils, gravel and stones, and by breaking tree roots.

4. It decreases runoff and therefore peak floods, and this helps to reduce the risk of over topping and damage to conservation works.

5. It loosens up the soil to below plough depth, without bringing the subsoil to the surface or burying the trash mulch.

6. It goes far to renovate old pastures by loosening up and aerating the roots, and by breaking up the compacted surface of the ground allows better absorption and penetration of rain and roots without destroying the surface cover.

7. It is one of the most satisfactory methods of re-establishing grass on areas completely denuded by over-grazing, etc., and with a compacted surface. See Figures 3 and 4.

8. When done by means of dynamite it greatly increases both growth and survival of fruit trees where subsoil conditions justify the measure.

9. Where lands have been cultivated for many years, or where irrigated lands have become **sealed with silt,** penetration is poor and waterlogging frequently occurs during prolonged wet spells.

Subsoiling, by loosening up the surface and subsoil, improves penetration and downward drainage and decreases the tendency to waterlog.

**Implements.**

The increase in the use of tractors during and since the Second World War has resulted in the development of a great variety of implements for subsoiling and chiselling. With the exception of the ox-drawn pick point or rooter plough all these are designed for tractor operation and are generally either of the hydraulic or self-lift type. Subsoiling is a tough job and implements require to be of heavy and rugged construction to stand up to the work. Implements range from the simple wheelless pan breaker and mole drainer absorbing 15 h.p. to the giant rippers with up to seven times penetrating two feet and taking 120 h.p.

A number of well-known firms now produce a standard type of wheeled chassis or tool carrier, on which can be mounted attachments for pan breaking, subsoiling, mole draining, ditching and listing.

The so-called trash farming has induced some firms to produce a chisel cultivator, cutting from six to 10 feet in width, with a penetration of from nine to fifteen inches, which is said to eliminate ploughing, and to produce an equally good seed bed quicker and with less labour, when followed by a one-way or offset disc, leaving all the trash on or near the surface.

In choosing your implement see that it is suited to the power of the tractor; a nice balance between the strength of the implement, the draft and the power of the tractor is essential for the best results. See that the implement has ample clearance and an effcient self or hydraulic lift system.

### Type and Condition of Soil.

No one would expect significant results from subsoiling sea sand or soft plastic clay, so it will be appreciated that to be beneficial both the type of soil and the condition of the soil is very important.

Although little experimental work has been carried out locally it would appear that soils which have a compacted or hard clay or gravel pan below the surface would respond most satisfactorily to subsoiling. There would probably be little result on either granite sand or black clay soils.

The former is seldom dry enough and in any case does not fracture well, and the latter expands so much when wet that it might be expected to swell and fill all the cracks the first time it became wet enough. The exception in all cases would be if hard pan or a hard compacted surface were present when breaking it up would no doubt produce temporary beneficial results.

If the granite sand were overlying quartz rubble the response might be better, as this is often so cemented together as to constitute a hard pan, the breaking up of which could hardly fail to do good.

Before embarking on a large subsoiling scheme therefore, ask yourself and find answers to these questions. What am I subsoiling for? How deep should I go? Will the results justify the cost in my soil? Is the soil dry enough to get the maximum result? When you have satisfactory answers, go ahead with an experimental acreage the first year.

### Pasture Subsoiling.

From observations made lately, it is beginning to be felt that where soil conditions are favourable, subsoiling may be preferable to pasture furrowing, and although more expensive this might be justified by the better and more lasting effect.

With pasture furrowing a considerable amount of turf is destroyed, it is difficult to make good banks and furrows when the soil is hard and dry, as is so often the case where furrows are required, and the furrows are shallow and liable to breakage with heavy rain before they are settled. Subsoiling obviates all these defects and in addition provides for deeper penetration of water and the aeration and loosening up of the roots.

It is felt that where an effective job of subsoiling has been done under good soil conditions, at least an equal amount of water is held up, and since it is held underground it is less subject to loss by evaporation.

Where bush encroachment is a problem this is likely to be increased rather than improved by subsoiling, because many plants mainly of the Acacia family, produce a new sapling each time the roots are broken, and a regular forest of new young trees may appear along the subsoiled lines the following year.

### Width Apart.

The frequency or width apart of the lines depends to some extent on the depth of penetration, but mainly on how well the soil fractures. When the work is going on the movement of the soil surface and the amount of upward bulge along the lines gives some indication of over what width and how effective the subsoiling is. Generally from three to five feet is satisfactory for deep penetration and from twelve to eighteen inches for chiselling for plough pan, or as a substitute for ploughing.

Try a small experimental area before launching out on a large acreage. A few hours of practical work will soon show up the difficulties and after the first rainy season the results.

### Warning.

1. On certain soils with a high clay content, subsoiling too near the edge of a gully will often promote subsoil erosion, and cause large stretches of the banks to become undermined and to slump into the gully.

Care should be taken, therefore, to keep well clear of the head and sides of gullies, when soil is cracked and conditions are such that subterranean erosion is likely. An allowance of thirty feet in ordinary soils and sixty feet in heavy clay soils would not be too much.

2. As has been mentioned before, in acacia or thorn tree country it is common to get a profuse regeneration of young plants along the subsoil lines either from seed or from sucker growth from the broken roots. Such growth (if widely enough spaced) might conceivably form useful barriers across steep slopes, but could lead to a most vicious form of bush encroachment if closely spaced and allowed to develop undisturbed.

3. To avoid damage to the subsoiler or tractor on striking rock, a spring hitch or shear pin should be used in the coupling, and it should be noted that the risks increase with the speed. Better safe and slow with a normal load than fast and risky with an overload.

# Notes on Trees of Chirinda Forest, Mount Selinda

By R. B. HACK, Warden.

Chirinda, or Mount Selinda Forest, is an area of 1,749 acres of evergreen high forest in the Chipinga District. Of this area, 1,274 acres on Gungunyana and Mount Selinda farms are owned by the Government and reserved as a National Park.

This forest is situated some 23 miles south of Chipinga at an altitude of about 3,400-4,000 feet. The average annual rainfall over a 30 year period is 60.22 inches.

Descriptive notes on trees numbered in the Forest are given below.

## *SAMYDACEAE.*

No. 1. *Casearia chirindensis* Engl. (Native name: Muhwahwati).

One of the largest trees of Chirinda Forest, growing up to three feet in diameter. The leaf is simple, alternate, glabrous and serrate, and the bark, which is rough, is of a light colour. The tree flowers during November. The timber is soft and white.

No. 2. *Oricia swynnertonii* (Bak.f.) Verdoorn. (Native names: Ruanziti, Munyabangwa).

A medium-sized tree with dark, glossy, evergreen, gland-dotted, aromatic, tri-foliate leaves. It flowers during October. The fruit, which is an orange-coloured berry, ripens during September and October. It is eaten by natives, baboons and trumpeter hornbills. It is probably the local food-plant of the butterfly *Papilio dardanus*.

No. 2A. *Fagara* sp. (cf. *F. macrophylla* Engl.) "Knobby Bark." (Native name: Mulungwana).

A large tree up to 80 feet high and 30 inches to 36 inches in diameter. The leaf is compound pinnate with a thorny petiole, light green, glabrous. In the young sapling the trunk is covered with thorns and as the tree matures these thorns change into knobs, hence the name "Knobby Bark." The wood is lemon coloured and when planed gives off a pleasant aromatic smell. A very fine cabinet wood.

## *MELIACEAE.*

No. 3. *Khaya nyasica* Stapf. (Native name: Muvava, Mbawa).

The famous "Big Tree" of Chirinda, which is about 200 feet high, is a *K. nyasica*. Its strongly buttressed base measures approximately 14 feet in diameter. Although the Khayas of Chirinda are the largest of the forest trees they are, however, not very plentiful, and there are probably not more than 300 over a foot in diameter in the entire forest. There is, however, a patch where 10 large trees over 150 feet high can be seen from a single vantage point. This spot is known locally as "The Valley of the Giants." The pinnate leaves are dark glossy green and about six inches in length, though in the case of young trees struggling in the shade of the forest the leaves are up to three feet in length. The flowers, which are small and white, appear during November. The fruits are four-celled capsules from one to two inches in diameter, and each capsule contains several flat, wafer-like seeds of a reddish brown colour. The wood, one of the mahoganies, assumes a darkish red colour on exposure and is an excellent furniture wood. Fallen trees, if left lying in the forest, will rot during a period of three to five years. Except for the sapwood the timber is not readily attacked by borers, but termites will eat it if it is left unprotected and exposed to them. The natives along the Buzi River in Portuguese East Africa use Khaya almost exclusively for making their dug-out canoes.

No. 4. *Lovoa swynnertonii* Bak.f. (Native name: Muvava).

This tree is known locally as the Brown Mahogany, and in general appearance closely resembles *K. nyasica* and the two trees con be readily confused in the forest. It grows to a height of 160 feet. The leaf of the Lovoa is pinnate but much smaller than that of Khaya. The margins of the leaflets are wavy. The Lovoa appears to prefer parts of the forest which are drier than those favoured by Khaya. The flowers, which appear during January, are white and produce small, elongated, four-celled seed capsules containing two-winged seeds in each cell. Lovoa does not produce seeds every year. The very attractive light to deep brown wood produced by this tree has a wavy grain and is very durable. Trees which have fallen in the forest probably about 50 years ago are found to have sound heartwood.

No. 5. *Trichilia chirindensis*, Swynnerton and Bak.f. (Native names: Mukuthlu mutsikiri).

This is a very large tree which is found with breast height diameters up to five feet. It is a common tree in this forest and can be identified by its crown of dark, glossy, green imparipinnate leaves, and somewhat scaly bark. The flowers are a yellowish white and the fruit a four-celled capsule containing black seeds with red arils. An edible oil is extracted from the seeds by the natives. The somewhat soft uniform timber is of a light orange colour and is useful for such a purpose as flooring but is apt to be attacked by borers if untreated.

## *OLACACEAE.*

No. 6. *Strombosia* sp. (Native name: Mutsahwari).

This is a large tree which occurs commonly in Chirinda Forest. It is easily identified by its bark which is a dark brownish grey colour which tends to flake off in irregular patches, thus leaving patches of a lighter colour. The leaves are simple, alternate, glabrous and entire. The fruit is a rough grey-coloured one-seeded drupe. The timber is hard heavy brittle and of a slaty red colour.

### *PAPILIONACEAE.*

No. 7. *Craibia brevicaudata* (Vatke) Dunn. (Native name: Mushamba).

A medium-sized tree seldom reaching 100 feet in height and two feet in diameter at breast height. It is one of the commonest trees in this forest. The leaves are pinnate, the glossy-green, entire, pointed leaflets being arranged alternately on the petiole. The bark is scaley, indented and of a dirty yellow colour, giving the trunk a characteristic and easily recognised appearance. The flowers which appear in September give the forest top a white appearance. The fruit is a large pod, the pods from the previous year split on the trees with a loud crack shortly after the flowers appear. The wood is very hard and difficult to split. Owing to its hardness and liability to be attacked by borers the timber is not used.

### *MIMOSACEAE.*

No. 8. *Piptadenia buchananii* Bak. (Native name: Mufumoti).

The mufumoti is a large tree up to four feet in diameter at breast height, which is common in the moister parts of Chirinda Forest. The leaves resemble those of the wattle. The characteristically smooth grey bark has horizontal red-brown stripes. The flowers which appear in October are of a cream colour in elongated spikes. The pods are thin, smooth, and about three inches long and contain oblong winged seeds. The wood is soft and whitish to pinkish or golden brown in colour. Logs are apt to split after felling and therefore are best sawn on a frame saw. It is subject to attack by borers.

No. 9. *Albizzia gummifera* (Gmel.) C. A. Smith. (Native name: Mujerenje).

This is a large flat-crowned tree not seen in the depths of the forest but common on the outskirts of Chirinda. The trunk, of a light colour and smooth, is found up to two feet in diameter at breast height. The leaf is bipinnate with leaflets rhombic and acute to obtuse at the apex. The mature pods are of a brownish colour and up to about six inches long by a little over an inch wide. The wood is tough and of medium hardness, the heartwood being of a yellowish colour. It is a useful wood for a number of purposes.

### *ROSACEAE.*

No. 10. *Parinari gilletii* De Wild.

This is a large and rare tree in the forest. It grows up to four feet in diameter at breast height. No local native name for this tree is known. The trunk resembles that of ***Khaya nyasica*** and the fruits bear a close resemblance to those of *Parinari mobola* (Muhatja) of Mashonaland. The timber is of a dull red brown colour and is exceedingly hard and heavy.

### *ARALIACEAE.*

No. 11. *Polyscias malosana* Harms. (Native Name: Mutengambia).

This is a very tall tree, the sapling of which somewhat resembles that of Khaya. The trunk is of a light grey colour and bears the marks of leaf scars and the mature tree branches at the top like a large candelabra. The leaves are pinnate, the leaflets being glabrous above, densely orchraceous tomentose beneath and tough and cloth-like to the touch. The timber is a soft white uniform wood and seasons well. Inch planks can be successfully air dried within six months.

### *SAPOTACEAE.*

No. 12. *Chrysophyllum fulvum* S. Moore. (Native name: Umhlanchwa).

A large, tall tree easily recognised by its smooth, russet red trunk, which is usually very deeply fluted at the base. The leaves are simple, alternate, entire and coriaceous. They are dark green and glossy above and have a brownish pubescence beneath. The silvery bronze effect on the under side of the leaves simplifies the recognition of this tree. The fruits resemble small russet-coloured potatoes and contain shiny black seeds. The timber is a light orange colour, uniform, free from knots and semi-hard.

### *EBENACEAE.*

No. 13. *Maba mualala* Welw. (Native name: Munyamakungu).

A large, tall straight tree up to two feet in diameter at breast height and 150 feet in height. The bark is scaly and black. The small dark leaves are simple, entire, alternate and glabrous. The fruit is a small black berry. The timber is very hard with black streaks in the heartwood. It is attacked by borers if untreated.

### *APOCYNACEAE.*

No. 14. *Rauvolfia inebrians* K. Schum. (Native name: Muzungurwi).

A large tree up to four feet in diameter with a rough, light grey bark. This tree does not grow very tall and prefers the outskirts of the forest rather than the depths. It grows easily as transplanted saplings up to two feet high. The leaves are in whorls and are simple, elongated and end in a sharp point. The small white flowers appear in early October. The fruit is a small black berry. The timber is a useful soft white wood. The Rauvolfia makes an easily-grown and handsome ornamental tree.

No. 15. *Conopharyngia usambarensis* (K. Schum.) Stapf. (Native name: Mukathlu).

A small tree with a crooked stem which is common in the undergrowth at Chirinda. The leaves are oblong to linear-oblong.

The white flowers, which appear in October, are a conspicuous feature of the forest at that time. The dark green egg-shaped fruits hang in pairs. This tree is of little value, being used to a limited extent only for firewood and building of native huts.

## *LOGANIACEAE.*

No. 16. *Strychnos mitis* S. Moore. (Native name: Mtambabungu).

One of the largest trees in Chirinda Forest, being found up to 3½ feet in diameter and 150 feet in height. The smooth trunk is of a greyish green colour and has a thin bark. The trunk has a gnarled appearance resembling somewhat the muscles of the arm when the fist is clenched. The leaves are simple, opposite, entire, glabrous, tough and dark green. The flowers are creamy-yellow and appear during January. The fruit is a small yellow berry. Although seeds are produced abundantly this tree appears not to reproduce itself readily, and the fact that blue monkeys and hornbills are fond of these may be accountable. The timber is hard and heavy and very resistant to nails when seasoned. It is a useful building timber but must not be exposed to damp.

No. 17. *Strychnos mellodora* S. Moore. (Native name: Chitonga).

A medium-sized tree seldom reaching more than 18 inches in diameter and 100 feet in height. The trunk is straight and has a clean appearance except for small protruberances which give it the appearance of being divided into fine horizontal lines. The bark is yellow when exposed by the cut of an axe. It is easily recognised by its leaves, which are dark green, simple, entire, opposite, glabrous and leathery. The minute white flowers come out in September and the yellow-berried fruits strew the forest floor in February. These fruits have a bitter taste and do not seem to be liked by either monkeys or birds. The tree is hardy and natural regeneration is prolific. The heartwood is of an orange yellow colour streaked with black. The wood is hard and close-grained. It is apt to warp and crack during drying. It is a good cabinet timber.

No. 18. *Anthocleista zambesiaca* Bek. (Native name: Garuro).

A tall tree with a crown of very large leaves. This tree grows to about 18 inches in diameter at Chirinda. It is not very common. The trunk is light grey and smooth except for old leaf scars. The wood is soft and white but has not been cut for timber at Mount Selinda.

## *EUPHORBIACEAE.*

No. 19. *Croton sylvaticus* Hochst. (Native name: Musukuta).

This is the well-known "Mount Selinda Linden." It is a tree with a spreading crown and is one of the few deciduous trees of the forest. The bole is light grey and rough. In the mature tree, which is up to three feet in diameter, the bole is marked by vertical stripes of a darker colour. Trees Nos. 1 and 14, mentioned above, have bark similar to *C. sylvaticus*. The trunks of these three can be confused. The leaves are simple, heart-shaped, alternate, hairy, soft-textured with a long petiole. The flowers are in spikes and the female flowers are scattered among the male flowers. The fruits are of an orange-red colour and are showy. The timber is a soft white wood flecked with black specks and is very apt to be attacked by insects if untreated.

No. 20. *Macaranga mellifera* Prain. (Native name: Mufukusha).

A large tree up to 30 inches in diameter and 120 feet in height. The leaf is heart-shaped like Croton but much larger. Mature trees of this species are not very common in Chirinda. It has not yet been cut for timber at Mount Selinda.

No. 21. *Tannodia swynnertonii* (S. Moore) Prain. (Native name: Munyabotabota).

A small tree with a fluted trunk about nine inches in diameter. The leaf is dark green, simple and heart-shaped. It is very common in all parts of the forest but is cut only for firewood. Owing to being usually too small for use as timber.

## *ULMACEAE.*

No. 22. *Celtis durandii* Engl. (Native name: Guiniti). Chirinda Stinkwood.

This is a large forest tree. The bark is grey-green in colour and with a texture like rough sandpaper. The trunk is strongly buttressed at the base. The stems of young trees are flecked with light-coloured specks. The leaves are simple, soft serrate (upper portion) and covered with fine hairs. The timber is hard, strong and durable, but it is not used on account of its objectionable smell. This odour is retained by the cut timber for years. Not to be confused with the Stinkwood of Knysna.

No. 23. *Trema guineensis* (Schum. and Thonn.) Fichlho. (Native name: Mugubvuru ?).

A medium-sized tree with leaves similar to those of Celtis but more completely serrate. The flower is greenish and not very conspicuous, and the fruit is a small black drupe. This tree grows freely inside as well as outside the forest. It is a fine ornamental tree with a soft white timber.

## *MORACEAE.*

No. 24. *Ficus* sp. (cf. *F. brachylepis* Welw. ex Hiern). (Native name: Mutsamvu).

This is the common parasitic fig tree of Chirinda. The tree which probably germinates from a seed which lodges in a crack in the bark of other trees, grows round the trunk of its victim like a large boa constrictor. In its final stage this fig tree forms a network round the host which eventually dies, leaving the fig tree in its place. Some of these fig trees stand 150 feet high and up to eight feet in diameter. The trunk has a latticework appearance and a hollow centre after the host tree has rotted.

No. 25. *Myrianthus holstii* Engl. (Native names: Muteswa, Bgambgambga).

A medium-sized tree with large palmate leaves, each with five to seven leaflets somewhat resembling those of the horse chestnut tree. The infructescence is about two inches in diameter and is edible.

# Herons and Egrets

By D. C. H. PLOWES,
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Rhodesia, because of its thick mantle of bush, and lack of streams, marshes and open water, is not as attractive to members of the heron family as is the Union of South Africa. We probably have as many representatives of this group here as there are in the south, but we lack the quantity. Apart from their economic value, they are birds of considerable aesthetic appeal, and they deserve every encouragement in an effort to increase their numbers.

To-day herons are afforded general protection, but in the middle ages they frequently graced the tables of nobility, and provided quarry for falconers. A generation ago, the white egrets were verging on extermination in several countries, particularly in America, due to the demand for the plumes from the breast and back, known as aigrettes, for use in ladies' millinery. The parents used to be killed in the breeding season, just for the sake of these few ornamental feathery plumes, resulting in the nests being left unattended and the chicks starving to death. To-day these birds are strictly protected, and their numbers are now slowly increasing.

A few years ago, heated controversy raged in the pages of South African farming journals, over the merits or otherwise of some of the larger herons. As with all our birds, very little intensive work has been done as yet on the feeding habits and economy of herons. A recent article in the "Ostrich," the journal of the South African Ornithological Society, has helped to throw some authoritative light on the subject, but much more research still remains to be done. This article contains the result of much patient observation by Mr. J. Sneyd Taylor on a colony of Black-necked Herons (*Ardea melanocephala*) at Fort Beaufort in the Cape. The Black-necked is among the largest heron commonly to be seen in Southern Africa. It is a bluish-grey colour, with a slate-grey back and wing flight-feathers. Its name is derived from the blackish head and neck, which contrasts markedly with the nearly white throat. The long legs and sharply-pointed bill are characteristic of the family, and have been evolved in response to the birds' mode of life. In the Union, he is equally at home stalking over lands in search of mice, locusts and other large insects, or standing in the reeds and sedges of a shallow vlei, ever on the look-out for frogs, fish and other water-animals.

Analysis of the food consumed by these birds is facilitated by the fact that they regurgitate the hard and indigestible portions of their prey in the form of pellets, and it was largely by this means that Mr. Taylor was able to deduce what constituted the bulk of their diet. Digestion of bones is more complete in this group than is the case with owls, where whole undamaged skulls can be found in the castings, and from which the exact identity of the species can be determined.

From an examination of 200 pellets, Mr. Taylor found that insects' remains occurred in 91 per cent. of the castings; mammals occurred in 61 per cent., and reptiles (including amphibians) were found in 59 per cent. Bird remains (probably nestlings) were much less frequent, being noted in only 9.5 per cent. of the pellets. Earthworms, scorpions and spiders were present in about 4 per cent. of the pellets.

In addition to this method of estimating the diet, Mr. Taylor was also able to procure specimens from below a nesting colony, which had been brought back by the adult herons and then dropped. From all these observations, he was able to definitely deduce that these birds play a useful role in agriculture, and that this more than nullifies any harm they may do in taking nestlings or other beneficial items.

The Black-necked Heron, in common with many others of the family, nests in colonies in marshes or trees. The trees most favoured are willows and poplars, especially when they are near water. As a rule, several species will be found nesting together, and there may be several hundred nests in all. Such colonies are known as heronries, and are used year after year. They are easy to locate, as there is a constant stream of birds backwards and forwards from the feeding grounds, which may be spread over a radius of five miles or more. Herons and egrets, and in particular, their chicks, are noisy creatures at the nest, and they keep up a continual croaking and clapping of bills, which may be heard several hundred yards away. The nests are made of twigs in the form of a shallow dish, and they are lined with leaves. Three eggs is the usual clutch, and with all herons and egrets, they are a light chalky to greenish-blue.

Every inducement should be offered to herons to encourage them to breed in the Colony, for the value of these birds is inestimable. The best means would be by planting suitable groves of trees alongside dams and rivers, and especially on islands. As yet, there are no records of the breeding by any of the larger or more important herons in this country, though they do so plentifully both to the south and north. It might be that our information is still too scanty, and that local heronries have not yet come to the notice of ornithologists. Herons breed in favoured places in the Transvaal bushveld, in Bechuanaland, and in Barotseland and the Kafue Flats in Northern Rhodesia. There is thus every possibility that they will extend their breeding range to this country as well.

Rather similar to the Black-necked Heron is the Grey Heron (*Ardea cinerea*). This bird has a very wide distribution, being found throughout most of Africa, as well as Europe and portions of Asia. It has a whitish neck, in contrast to the black of its near relative, and has a black stripe just above the eyes, terminating in a few longish plumes at the back of the head.

This bird is far more dependent on water than the Black-necked, and in consequence, is very seldom seen in Matabeleland.

It probably takes as wide a variety of food as does its cousin, but fish and water animals play a larger role in its diet. Except at breeding time, it is a solitary bird, to be seen standing motionless in the shallows of a vlei, with the neck drawn up into the typical "S" pattern of all herons.

Taller than either of the two preceding birds, is the Goliath Heron (*Ardea goliath*). It has a grey back, with chestnut-red neck and belly, and stands nearly five feet high. Although it has a very wide distribution, it is in all places a scarce bird, more than a pair being seldom seen on the same stretch of water.

Purple Herons (*Ardea purpurea*) are very occasionally met with in Rhodesia, being, like the others, much more common to the north and south. It is typically a bird of vleis where it hides in the grass and sedges, in wait of frogs and probably, also, water-rats.

The next three birds are all rather similar, being plain white, but may be distinguished by the colours of their legs and bills, as well as by size, though this is liable to be deceptive. These three birds are the Great White Heron (*Casmerodius albus melanorhynchus*), the Yellow-billed Egret (*Egretta intermedia brachyrhyncha*), and the Little Egret (*Egretta garzetta*). The first is exclusively a water bird, and while the other two do occasionally wander in the veld in company with Cattle Egrets, they are most commonly found in the vicinity of streams and vleis. All three are very scarce in this country.

The only member of the family which is to be found in any numbers here is the Cattle Egret (*Bubulcus ibis*). This is the common white bird found in small flocks following cattle in the veld. It occurs as far north as Spain, but is a typical sight in most of the more open veld of Africa. In the north, it follows game in the absence of cattle; insects disturbed from the grass by the animals are its chief source of food, but it will also take insects from off the animals themselves. It is thought that the insects pecked off the animals are mainly ticks, but as yet no-one seems to have done any detailed stomach analyses of this species.

A few people have suggested that Cattle Egrets may be the vectors or disseminators of certain stock diseases, and while this is not impossible, it is very improbable, as the birds seldom are in actual contact with the animals; an occasional brief peck at an insect is hardly likely to transmit an infection from one beast to another.

Virtually all authorities are in agreement that the Cattle Egret is one of the most useful, as well as ornamental, birds which we have, and everywhere it is accorded full protection. A flock of these dazzling white birds following a herd of cattle through the veld, or else winging their way homewards, in perfect "V" formation, is indeed a lovely sight.

The breeding habits of the Rhodesian birds are still a complete mystery. In South Africa, these birds breed in mid-summer, which is when Cattle Egrets are at their commonest in Rhodesia. They are to be found here throughout the year, though disappearing from Matabeleland in winter. They are in breeding plumage in summer, yet it would appear that it is in winter that they retire from here to breed. In Northern Rhodesia, they breed from February to June, and it would be interesting to know if our birds move that far for this purpose. There is no doubt that they are migratory to some extent, and it is hoped that ringing of the birds will eventually throw some light on this subject.

Similar in size to the Cattle Egret, is the Black Heron (*Melanophoyx ardesiaca*). As the name indicates, it is completely black, but with a greyish bloom to the feathers. It has a habit, unique among birds, of shading the water with its wings, in order to eliminate surface reflection. As it stalks along through the shallows, it throws its wings forward to form a complete umbrella over its head, from beneath which it peers into the water in search of tadpoles or fish. Though nowhere common, this bird seems to be on the increase in Southern Africa, but as yet has not been known to breed here.

The last two herons worth mentioning are the Green-backed (*Butorides striatus atricapillus*), and the Night Heron (*Nycticorax nycticorax*). The former is a small solitary bird, to be found on most Rhodesian streams perched in the lower branches of a small tree or bush over the water. Little seems to be known of its diet, though this probably consists of snails and other small water-animals.

The Night Heron is a rather striking bird, with greeny-black back and whitish underparts, and a long white plume from behind each ear. It is nocturnal for the greater part, spending the day sitting motionless in a leafy tree over water. It breeds in company with Cattle Egrets and Herons in the Union, but there appear to be no records from Rhodesia.

In all, the Herons and Egrets have a very favourable balance sheet to their credit, and deserve every protection. It is to be hoped that with the increasing numbers of dams being built, and with larger areas being cleared of bush, that these birds will in future be a more abundant feature of our veld than hitherto.

Cattle Egrets drinking at sunset.

Black-necked Heron. The commonest of the larger herons.

# Some Notes on the Properties of Vermiculite in relation to its use in Agriculture and Horticulture

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## INTRODUCTION.

In Rhodesia exfoliated vermiculite is being used for agricultural and horticultural purposes, but little or no experimental data is available as to its value in this connection. It is hoped that the present paper will help to remedy this deficiency and lead to a better understanding of those properties of vermiculite that are of importance for various purposes.

Determinations have been made of the amount of water that can be retained by vermiculite at saturation, at field capacity, and at the wilting point; for comparison similar determinations were made on three widely different soils. Evaporation rates, temperatures and pH values were also determined.

In the light of these results a discussion of the agricultural and horticultural use of vermiculite is given.

## EXPERIMENTAL.

The samples of exfoliated vermiculite for this work were kindly donated by Central African Base Metals, Ltd., and by the Sabi Vermiculite Company.

The soils used for comparison were:—

(1) A red clay of the Salisbury series, derived from dolerite, and having a total nitrogen content of 0.16%;

(2) A very light grey coarse sand typical of the granite sandveld areas (total nitrogen 0.04%);

(3) A black sandy loam from a granite sandveld vlei and containing a relatively high proportion of organic matter (total nitrogen 0.40%).

In all cases the water contents have been expressed on a **volume** basis. It is the amount of water available in a given volume that is the important factor in plant growth. Results expressed on a weight basis for materials of such widely varying densities as soil and vermiculite would not be comparable. The actual determinations were made gravimetrically and converted to a volume basis using determined density values. It must be emphasised that these figures should be regarded as being only approximations to the actual results which might obtain in practice. This is due mainly to the fairly considerable differences that can be obtained in the density figures by varying the compaction of the soil or vermiculite, and also to the fact that a certain amount of expansion occurs during wetting.

The following techniques were employed:—

**Density.**—The apparent densities of the air dry materials were determined by weighing against an equal volume of water, each sample being packed only under its own weight.

**Maximum Water Holding Capacity.**—The maximum amount of water that could be retained by a 1 to 2 inch layer of the sample on a fine meshed sieve against gravity was determined. This method was simple and quick and proved to give good agreement with standard methods employing the Keen Raczkowski box.

**Field Capacity and Wilting Point.**—The method used was similar to that employed at Rothamstead (Russell and Balcerek, Journal of Agricultural Science, Vol. 34, p. 130).

For the field capacity the samples were equilibriated at a suction of 20 inches of water (representing a pF of 1.7). This should give a fair approximation to the actual suction which is experienced in the field under average conditions of free drainage.

For the wilting point the samples were equilibriated in an atmosphere of relative humidity 98.5% (representing a pF of 4.2). The figures obtained were confirmed by actual wilting trials with maize plants. The plants were found to wilt permanently when the moisture content was, within experimental errors, the same as that obtained at pF 4.2.

*The term pF is one used by soil psysicists to indicate the force with which water is retained in a soil. It represents the logarithm of the suction (in inches of water) against which the soil can retain a particular amount of water.*

**pH.** 1:5 suspensions in distilled water were used and a glass electrode employed.

## RESULTS.

### Water Holding Capacities and Wilting Points.

The results obtained for these are shown in Table I.

TABLE I.

| Sample | | Apparent Density | Maximum Water held against gravity at saturation % Moisture by Volume | Field Capacity (at pF 1.7) % Moisture by Volume | Wilting Point (at pF 4.2) % Moisture by Volume |
|---|---|---|---|---|---|
| Salisbury red clay | | 1.2 | 60 | 35 | 12 |
| Coarse light-grey granite sand | | 1.5 | 33 | 16 | 1.9 |
| Black sandy loam from sandveld vlei | | 0.9 | 68 | 29 | 13 |
| Exfoliated Vermiculite | Dust | 0.38* | 72* | — | — |
| | Fine grade (1/8-1/16″ mesh) | 0.27* | 68* | 19 | 1.8 |
| | Medium grade (1/4-1/8″ mesh) | 0.25* | 64* | — | — |

* These figures are mean values for several different samples.

Vermiculite shows a very wide discrepancy between its water contents at saturation and at field capacity, much wider than is the case for soils. This is to be anticipated since exfoliated vermiculite has a very high pore space and so can accommodate a large amount of water at saturation; these pores are however comparatively large, and so cannot retentively hold water against suction such as would be experienced in the field under conditions of free drainage. Since water is easily withdrawn the wilting point is low.

The pore spaces in the sand being also comparatively large, it has a low field capacity and wilting point similar to that of vermiculite. The total pore space in the sand is however very much less, so that the water content at saturation is also less.

The much finer pore spaces in the clay and in the sandy loam of high humus content enable them to retain more water against suction; thus both the field capacities and wilting points are higher.

## Water Available to Plants and Relative Rates of Evaporation.

Samples of soil and vermiculite were raised to saturation and then allowed to dry out under similar conditions for four days. The results are shown in Table II.

TABLE II.

| Sample | Water available to plants held at saturation (Saturation Capacity —Wilting Point) % by Volume | Water lost by evaporation in four days % by Volume | % of water that is available lost in four days |
|---|---|---|---|
| **Salisbury red clay** | **48** | **40** | **83** |
| **Coarse light-grey granite sand** | **31** | **29** | **94** |
| **Black sandy loam from sandveld vlei** | **55** | **31** | **56** |
| **Exfoliated vermiculite (fine)** | **66** | **30** | **45** |

In general there is not a very great difference in the absolute rates at which water is lost from these soils and from vermiculite. There is however a considerable difference in the amount of water initially present that is available to plants, so that plants should survive for much longer in vermiculite than in the clay or sand and for somewhat longer than in the sandy loam of high humus content. This is shown in the last column of Table II, and was confirmed by pot experiments with maize. When the plants had reached about nine inches in height the pots were well saturated and then allowed to dry out in a greenhouse. It was found that the maize in Salisbury red clay wilted after about six days whilst that in vermiculite wilted after about twenty days.

It should be emphasised that these results apply only when the soil or vermiculite can be raised to saturation capacity, as in seed tins or boxes where there is no suction from adjacent drier soil or from drainage through the soil profile.

In the field where free drainage exists it is not possible to raise the soil above field capacity; there is then no great difference between the water available to plants that can be held by soils and by vermiculite. This is shown in Table III.

TABLE III.

| Sample | Water available to plants under field conditions (Field Capacity—Wilting Point) % by volume |
|---|---|
| Salisbury red clay | 23 |
| Coarse light-grey granite sand | 14 |
| Black sandy loam from sandveld vlei | 16 |
| Exfoliated vermiculite (fine) | 17 |

The relative rates of evaporation obtained for these soils and vermiculite in the experiment mentioned will not necessarily hold under field conditions where so many other factors are of importance. It is obvious, however, from the similarity in the amounts of available water that can be held under field conditions by these soils and by vermiculite, that the relative field evaporation rates would have to differ widely from those observed in the above experiment for there to be any appreciable improvement in moisture status resulting from the use of vermiculite in the field.

## pH Values.

Different samples of vermiculite may have somewhat different reactions. It has been found in general that:—

Vermiculite from Winterstale has a pH of from 6—7, while

Vermiculite from the Sabi has a pH of from 8—9.5.

Unlike soils, a high pH in vermiculite does not necessarily indicate any accumulation of salts. Vermiculite is an inert material and, as it is not buffered by the presence of soluble salts, only very small traces of soluble basic minerals are necessary to raise the pH to quite a high value. Such traces need not be harmful to plant growth.

If vermiculite is mixed with soil, then, in anything up to high concentrations of vermiculite, the pH of the vermiculite is of little significance in its effect on the pH of the mixture. This is due to the comparatively high buffering action of the soil, and is illustrated in Table IV by a series of pH determinations that were made on mixtures of Salisbury red clay (pH 6.1) with an alkaline sample of vermiculite (pH 8.9).

TABLE IV.

| % Vermiculite | % Red Clay | pH of Mixture |
|---|---|---|
| 0 | 100 | 6.1 |
| 15 | 85 | 6.3 |
| 35 | 65 | 6.5 |
| 65 | 35 | 6.7 |
| 85 | 15 | 7.0 |
| 100 | 0 | 8.9 |

**Temperatures.**

Samples of soil and vermiculite were placed in fairly large pots and raised to field capacity by watering with the calculated quantity of water in the early morning. They were then placed in a position sheltered from wind but exposed to the full rays of the sun on a hot September day. At 2.30 p.m. temperatures were taken and were as shown in Table V.

TABLE V.

| Sample | Temperatures at 2.30 p.m.<br>Surface Temperature °F | <br>Temperature at a depth of 4-5 inches °F |
|---|---|---|
| Salisbury red clay | 100 | 88 |
| Coarse light-grey granite sand | 91 | 90 |
| Black sandy loam from sandveld vlei | 109 | 97 |
| Exfoliated vermiculite (medium) | 91 | 73 |

The surface temperatures depend largely on the colour of the material. Thus the black soil which will absorb most heat shows the highest temperature; the red soil is intermediate between the black soil and the light coloured sand and vermiculite.

The temperatures at a depth of four to five inches are of more importance as far as the root zone of small plants is concerned. At this depth the vermiculite remains cooler than either the red clay or coarse sand which are in turn cooler than the black vlei soil. It has been stated that the optimum temperature for nitrification in soils lies between 80 and 90°F; but, in the absence of data as to the ideal growing temperature for plants, it is difficult to interpret the above results. It should be remembered that the conditions of this experiment were more severe than is likely to occur in the field, particularly in seed beds; the samples were completely sheltered from wind and were exposed to full strong sunshine throughout the heat of the day without receiving any additional watering. On the whole, it is perhaps doubtful whether the use of vermiculite in order to maintain lower temperatures is of real value even in summer, whereas it is probably an actual disadvantage in winter.

## SOME NOTES OF THE AGRICULTURAL USES OF VERMICULITE.

As a cultural medium for plant growth vermiculite offers a very open textured material which permits rapid and easy root penetration and allows good aeration. Being an inert material it does not supply any plant foods and cannot offer any means for the retention of added nutrient elements, as is supplied by the clay complex in a soil.

Vermiculite may thus be used for any of the horticultural purposes to which washed sand was formerly put, such as the striking of cuttings and hydroponics. The finer meshed grades of vermiculite should be the best for this purpose. The advantage of vermiculite over sand is that at saturation it has a much higher water holding capacity, whilst it has an equally low wilting point.

If pure vermiculite is to be used in this way it is perhaps advisable to select a sample of vermiculite which has a pH value falling within the generally accepted range for plant growth. In this connection, however, it is worth noting that the author has raised plants from seedlings to maturity using a sample of vermiculite of pH 9.3.

Vermiculite has also been advocated as a soil ameliorant when preparing seed beds and tins and for various other cultural uses. For this purpose the pH of the vermiculite is of little significance. When discussing these uses of vermiculite it is necessary that they should be considered in two distinct categories. Firstly there is the use of vermiculite in situations where it is possible to raise the material to a moisture content approaching saturation; this applies to seed boxes, tins and pots. Secondly, there is the use of vermiculite in the field and in beds in well drained localities where it is not possible to raise the moisture content above field capacity.

### The Use of Vermiculite in Seed Boxes, Tins and Pots.

Reference to Tables I and II will show that vermiculite when saturated with water will retain 66% by volume of water available to plants, as compared with 55% for the black sandy loam of high humus content, 48% for the red clay, and 31% for the granite sand. On the score of moisture holding capacity alone, therefore, vermiculite offers a big advantage over soil. A further advantage is the open textured nature of the material which allows of vigorous root development.

If pure vermiculite is used there is the disadvantage that plant foods must be continuously supplied. It would therefore be best to use a mixture of vermiculite (a fairly fine meshed grade is probably best) with a good soil containing a fair proportion of clay. It is suggested that a 50/50 mixture should be suitable.

### The Use of Vermiculite in Seed Beds or in the Field Generally.

Reference to Tables I and III will show that there is no great difference between the amounts of water available to plants that can be held by soils and by vermiculite at field capacity, under conditions of good drainage. Unless the use of vermiculite very significantly decreases the evaporation rate in the field (evidence for which is not available) there would appear to be little advantage to be gained from its use on the score of improving the moisture status of the soil.

In general, where moisture has to be conserved, the use of a mulch is undoubtedly the most efficient method. This does not of course improve the water-holding capacity of the soil, but it does reduce evaporation losses. A coarse grade of vermiculite would be very suitable for this and would have the advantage of being sterile and less likely to harbour pests; but its use in this way would prove expensive.

The use of vermiculite in heavy soils would undoubtedly produce an improvement in texture; but superior, though temporary, textural improvements can be achieved with the use of less expensive aerating materials such as manure ,and garden refuse.

The use of vermiculite in sandy soils would not appear to offer any advantages over the use of organic matter or of richêr heavier soils, whereas these latter have the advantage of improving fertility.

When used for filling holes during transplanting, vermiculite has the advantage that it may be transported in a moist, saturated condition without danger of puddling. It can be thus used as a convenient vehicle for supplying extra moisture to transplants where they cannot be watered. This vermiculite will not, however, bring about any improvement in the capacity of the land for retaining moisture.

# Tsetse Fly in S. Rhodesia, 1949

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Before detailing the work carried out against Tsetse during 1949, a short explanatory introduction is included so that those who do not follow this work from year to year may be better able to appreciate the position.

The Tsetse Fly is well known as one of man's worst enemies over the greater part of Africa south of the Sahara. What is not so generally realised is that there are about twenty different species of Tsetse Fly (genus *Glossina*) occurring in the continent.

The significance of the Tsetse to man lies in the fact that most, if not all, of the species are capable of bringing and spreading trypanosomiasis among man and his domestic animals. The most important African forms of this disease are known as sleeping sickness in man, and nagana in cattle.

The different species of Tsetse are all of rather similar appearance, and they are further alike in that they all feed exclusively on the blood of vertebrate animals. They differ widely, however, in their preferences for different vertebrates as a source of food, reptiles, birds, game animals, man, and even carnivores being all attacked in varying degree by different species. Furthermore, although several species of Tsetse may sometimes be established in one area, no two species of Tsetse have exactly the same ecological requirements. Thus it will be apparent that a method of control used successfully against any one species of Tsetse in a particular locality may be quite ineffective against another species of Tsetse, or even against the same species in a different locality. So far no practical method of control has been discovered which is effective against all species in all localities.

In Southern Rhodesia three species of Tsetse, *G. morsitans*, Westw., *G. pallidipes*, Aust., and *G. brevipalpis*, Newst., occur. *G. morsitans* is widespread in the northern part of the Colony, in and adjoining the Zambesi Valley, and is found again just across the South-Eastern border of the Colony. The other two species are found only along a small part of the South-Eastern border of the Colony near Mount Silinda, except for a small area in the Sebungwe and Wankie Districts, in which *G. pallidipes* occurs. The present distribution of the three species is shown on the accompanying map. Two other areas of distribution are also shown. The first is of historical interest and shows the distribution of *G. morsitans* in the mid-nineteenth century, having been deduced from the writings of various early travellers. This area is important in so far as it shows how much of the Colony might be overrun by this Tsetse were active steps for its control not taken. At the end of the last century Tsetse disappeared from the previously infasted southern part of the Colony and almost completely from the northern part, remaining only in a few small isolated "residual foci." This was mainly due to the fact that, in 1896, an outbreak of rinderpest swept through the Colony, killing off a large proportion of the game and thus greatly reducing the food available for Tsetse. From these residual foci Tsetse began to spread and were in process of re-occupying their former natural haunts. In 1919 game reduction operations were introduced, experimentally at first, and the spread was checked by about 1930. By this time the area shown north of the broken line on the map had been re-occupied by them. The stippled area between this boundary and the boundary of present distribution represents the amount of land, about 10,000 square miles, reclaimed by Tsetse Fly Operations. It must also be borne in mind that, had these operations not been initiated, a considerable part, if not all, of the area between the nineteenth century and 1930 boundaries, would probably have been re-occupied.

For the control of *G. morsitans* in Southern Rhodesia, controlled discriminate game destruction has been carried out since 1925. By this method the larger game animals, on which alone *G. morsitans* can thrive, are so reduced in numbers in a belt (usually about twenty miles wide) along the boundary of infestation that the Tsetse can no longer survive, because it is unable to obtain meals with sufficient dependability and regularity. Thus the fly, in effect, retreats. The barrier belt is then pushed forward by about half its depth, and the Tsetse is driven in turn from this new belt. This process can be repeated.

A fundamental feature of this type of control is that no attempt is made to reclaim land unless the land is required for settlement and development. There are two main reasons for this. One is that it is desired to keep the number of game animals necessarily destroyed as low as possible. The other reason is that sufficiently close settlement of land, if the land can continue to support such settlement, is, of itself, an excellent barrier to the renewed spread of Tsetse. The present position is that the barrier belts have been kept stationary since 1940 and are used to prevent a renewed advance of fly into country already reclaimed.

Since *G. brevipalpis* and *G. pallidipes* can thrive on other than the larger game animals, it follows that the method of game destruction cannot in practice be applied to the control of these two species of Tsetse. Fortunately, these species, the forest and thicket flies, are more dependent on shade for survival than is *G. morsitans*. Therefore a barrier clearing about 40 miles long and on the average about one mile wide has been constructed and maintained along the Eastern border of the Colony, part of the clearing being in Portuguese territory. These two species are present in high density on the Portuguese side of the clearing, as is *G. morsitans* along part of its length, but they seldom, if ever, succeed in crossing the barrier clearing. Since the clearing was widened to its present width no Tsetse have been seen west of it. That Tsetse may sometimes cross it is surmised from the occasional limited outbreaks of animal trypanosomiasis occurring on the Rhodesian side. There are, however, other possible explanations for these outbreaks. To counter them the cattle are subject to strict veterinary supervision under the direction of the Director of Veterinary Services, so that deaths from nagana seldom occur in this area now.

Game sanctuaries in the neighbourhood of Tsetse Fly Areas remain as in 1948. The Wankie Game Reserve has, however, now been constituted a National Park. As last year, it remains free from the threat of Tsetse Fly. The area between the Angwa and Rekomitje Rivers North of the Zambesi Escarpment is still closed to all shooting, and the game there remains unmolested.

The results of the year's work are particularly difficult to assess owing to the prolonged and severe dry season. In several areas pools and waterholes which had been regarded as permanent dried up for the first time in the memory of the local inhabitants. This led to game ranging more widely than is usual, and it is surmised that this explained the capture of occasional flies outside the areas to which our operations normally confine them. Support for this hypothesis is forthcoming from the numbers of Tsetse caught by traffic on the Sinoia-Chirundu road. These increased enormously during the dry season and in some months the totals were higher than had ever previously been recorded since the commencement of these observations. With the advent of the rains, the numbers fell to normal in November. The increase here was associated particularly with the abundance and wide ranging of elephants. In other affected areas, namely Sebungwe, Urungwe, and Zambesi Valley (Hunyani), these animals, and also buffalo, were noted as being numerous and much given to wandering. Because of this obscuring feature it is not possible to say that in any area the position has materially improved during the year. Nevertheless there are no indications that any permanent advance of fly has occurred in any area, and there has been no advance into reclaimed ground outside our hunting areas.

It is also possible that a cyclical increase of *G. morsitans* is beginning. Such behaviour has been suggested elsewhere with other species of *Glossina*. Observations in subsequent years should show whether this is so. In the Hartley District again no Tsetse have been caught east of the Umniati River. A report of two flies said to have been caught on the Gadza River was painstakingly investigated and, in the absence of any confirmatory evidence, is considered to be false. Development of the Sanyati Native Reserve continues, there being an estimated population now of 729 natives who own 535 head of cattle. There were no cases of trypanosomiasis either in these or in any other cattle in the Hartley District.

The measures instituted in 1948 in the Mtoko District for the control of the animal trypanosomiasis outbreaks in the Mkota and Chikwizo Reserves, namely the shooting of a limited number of elephant and inoculation of cattle with dimidium bromide, were continued in 1949. The Portuguese authorities have co-operated by shooting game on their side of the border and erecting a fly-chamber on the main Border-Changara road. The incidence of animal trypanosomiasis in the area has been less than in 1948.

In the Chipinga area the number of reported cases of animal trypanosomiasis was rather less than in 1948. The only outbreak of abnormal proportions occurred on the farm, Mount Silinda, and was probably due to cattle straying across the clearing into the heavily infested Tsetse bush on the Portuguese side of the clearing.

In all other areas the position shows very little change since 1948.

Cases of human trypanosomiasis, or sleeping sickness, in Southern Rhodesia numbered three as against nine in 1948. One case was fatal, and this case probably contracted the disease in Southern Rhodesia.

The length of road wholly or partly constructed and maintained by Tsetse Fly Operations or through its vote is approximately 500 miles.

Some further information on the drug, Antrycide, came to light during the year. The drug has not been used at all in this Colony because of one disturbing feature. It was discovered elsewhere that in some cases resistant strains of trypanosomes (the causative organisms of trypanosomiasis) were built up following the use of Antrycide. These strains were discovered to be resistant, not only to Antrycide, but also to dimidium bromide (which is perhaps better known as Phenanthredinium 1553), which has been in use for some years by the Veterinary Department as an effective curative drug for animal trypanosomiasis in this Colony. There was thus the risk that, were Antrycide used, any initial advantage gained might later on be completely outweighed by the development of these resistant strains, leaving Antrycide and our other most satisfactory curative drug, dimidium bromide, comparatively useless. It was felt that circumstances did not justify this risk, and the use of Antrycide has therefore been deferred until more is known about this aspect.

## Conferences and Committees.

The first meeting of the International Scientific Committee for Tsetse and Trypanosomiasis Research was held in London from February 8th to 11th, 1949. Southern Rhodesia was represented by Dr. G. R. Ross, Director of Curative Services, and Mr. J. K. Chorley, Director of Research and Specialist Services. Mr. D. A. Lawrence, Assistant Director of Veterinary Services (Research), attended as veterinary observer and adviser. Matters connected with trypanosomiasis (affecting many African territories), and particularly the drug Antrycide, were discussed at the conference.

The conference was fully reported to the Southern Rhodesia Trypanosomiasis Committee by the delegates on their return.

The Bureau Permanent Interafricain de la Tsétsé et de la Trypanosome was established at Leopoldville during the year, and much useful information received from it circulated among the members of the Southern Rhodesia Trypanosomiasis Committee.

Two full meetings of the Southern Rhodesia Trypanosomiasis Committee and one special sub-committee meeting were attended.

The discussions of this Committee included:—

1. The trypanosomiasis position in the Mtoko District resulting from the fly-belt in neighbouring Portuguese territory.

2. The information obtained by the Southern Rhodesian representatives at the first meeting of the International Scientific Committee for Tsetse and Trypanosomiasis Research.

3. The award of scholarships by the Beit Railway Trust for Tsetse Research and attendant conditions.

4. The latest information received in connection with the Zululand DDT experiments for the control of Tsetse.

5. The outbreak of animal trypanosomiasis at Mount Silinda.

6. Participation in the work of the Tsetse Fly and Trypanosomiasis Permanent Inter-African Bureau at Leopoldville.

7. The expressed views of the Wild Life Protection Society of Rhodesia in regard to the present method of Tsetse Control.

8. Several minor matters.

### Destruction of Game.

The number of head of game destroyed increased from 22,160 in 1948 to 24,871 in 1949. This increase is due partly to the intensification of shooting which took place in the Sebungwe District and partly to the reintroduction of shooting duiker there.

The award of 2s. 6d. placed on the head of a baboon since its classification as vermin seems to have had no effect on the numbers destroyed on Tsetse Fly Operations (1,884 compared with 2,079 in 1948). This is attributed to the fact that the hunters utilise all the edible meat of the game which they shoot, and are naturally inclined to satisfy their appetites before expending their limited ammunition on baboons. A reward of 2s. 6d. for a baboon would be likely to alter the position only if they otherwise destroyed more edible game than they could utilise.

During the year an average of 2.29 rounds of ammunition per head of game destroyed was used. The number of each species destroyed was as follows:—

| | | | |
|---|---|---|---|
| Elephant | 42 | Reedbuck | 663 |
| Rhinoceros | 3 | Bushbuck | 1,841 |
| Buffalo | 393 | Duiker | 6,749 |
| Zebra | 226 | Warthog | 3,629 |
| Eland | 254 | Bush Pig | 813 |
| Kudu | 3,953 | Baboon | 1,884 |
| Roan | 268 | Lion | 7 |
| Sable | 1,005 | Leopard | 16 |
| Waterbuck | 479 | Cheetah | 1 |
| Hartebeest | 39 | Hyaena | 9 |
| Tsessebe | 104 | Wild Dog | 15 |
| Impala | 2,477 | Jackal | 1 |
| | Total | 24,871 | |

## SHORT SURVEY OF THE TSETSE FLY OPERATIONS BY DISTRICTS.

### Darwin.

There is no significant change to report from this area. Fly, *G. morsitans*, occupies the same ground as last year, but is in very low density over most of the infested area except on the Portuguese border. There has been no evidence of any tendency of fly to spread and no fly have been seen above the escarpment in this area.

No accurate figures for the number of cattle in the area are available, but it is known that there are over 100 head in the region of Kaitano's kraal. No cases of trypanosomiasis have occurred in the area.

### Zambesi Valley (Hunyani).

This area has been renamed, since Lomagundi (Doma), the site of the Ranger's old camp, is now well behind the present line of Tsetse Fly Operations.

There is little to report from the area. No fly were seen above the escarpment, but *G. morsitans* persists in the valley. This area was one of those most affected by the drought, with consequent wide ranging of game, particularly noticeable in the case of elephant and buffalo. This led to a temporary increase in fly near the escarpment on the Angwa River, where practically the only surface water, other than the Hunyani River, in the area was located, at the end of the dry season. No corresponding increase on the Hunyani River, where Tsetse now occur only sparingly below the Ranger's camp was noticed. Elsewhere in the area fly is thinly distributed, becoming more numerous on the Hunyani close to the Portuguese border, but beyond the area of present operations.

There are 21 head of cattle at the Msengedzi Mission and no cases of trypanosomiasis have been reported from this area.

### Urungwe.

The effects of the drought were perhaps more marked in this area than in any other, and game wandered for great distances in search of water. Some sources of water which dried up were stated by the local natives never to have done so before. Consequently, as was to be expected, a few Tsetse were found outside their normal area of distribution, including one on the Mtshowe River in the south-west of the area. With the onset of the rains in November, the position, as far as could be judged, appeared rapidly to return to normal. *G. morsitans* remains fairly dense at all places in the area below the Zambesi escarpment, and is present in varying densities along the Sanyati River and its tributaries as far south as the Tengwe River. At Chipisa Spring, where fly used to very dense, it has now almost completely disappeared. This is a result of heavy settlement connected with mining activity having destroyed or driven away all the game. It is seldom now that any game is seen here. This activity may not be permanent, and if it is not it will probably be difficult to maintain the position.

The amount of traffic up and down the escarpment, particularly foot but including also vehicles, increased greatly and accordingly a barrier was erected with a fly picket at the Midway Mine. The Native Department co-operated fully and compelled all natives to pass through the barrier instead of using any of several footpaths in the area. Such uncontrolled traffic would otherwise permit Tsetse to be brought up the escarpment. The erection of the barrier was fully justified as can be seen from the numbers of Tsetse caught, shown in the Traffic Control section of this report.

The number of cattle present in the Urungwe Native Reserve increased during the year to 7,528. No cases of animal trypanosomiasis were reported anywhere in the area.

**Chirundu.**

As with the Urungwe Area this area was markedly affected by drought. Elephant became particularly numerous, wandered a great deal, and were often seen close to the main Chirundu Bridge road. As they are not shot in this area they are probably largely responsible for the very marked increase in the numbers of Tsetse (*G. morsitans*) caught at all traffic control points in the latter part of the dry season. Although the total numbers of Tsetse caught in the year at each of these points (see Traffic Control section) are much higher than in recent years, a deterioration in the position is not necessarily indicated. During the early months of the year, and again in November and December after the rains had started, the numbers were normal for recent years. The increased totals are made up entirely by the greatly increased numbers caught in the latter part of the dry season.

Shooting in the area has again been confined to a belt five miles wide on each side of the main road between the escarpment and Chirundu Bridge. No effort is being made to exterminate Tsetse in the area. Any such effort would necessitate extending the operations over a much larger area without the prospect of holding the land so gained by settlement and development. The present operations aim only at reducing the density of game and Tsetse along the main road, so as to reduce the numbers of Tsetse being transported by traffic along the road.

**Lomagundi S.W.**

The position in this area remains much the same as last year. No evidence of any renewed spread of fly has been found, and again no fly has been seen west of the Umniati and Sanyati Rivers south of the Mtshowe River, which is the northern boundary of this area. In view of the occurrence of *G. pallidipes* further west in the Sebungwe District a careful watch for this species has been kept, including reconnaissances into the Sebungwe Native Reserve beyond the present area of operations. No evidence of the occurrence of this species has so far been found. As it is a species which, if present in small numbers, may be difficult to detect, the search for it will continue.

The nearest cattle to the fly belt in this area are at Hova's, about 10 miles east of Sanyati Junction. They have remained in good condition throughout the year. No cases of animal trypanosomiasis have been reported anywhere in the area.

**Hartley.**

Again no Tsetse have been seen in the Hartley District despite thorough search. Reports of their presence have been made by native hunters in the Ruswingo Vlei area. As native hunters are usually expert at catching Tsetses, the absence of specimens discredits these reports. Two Tsetse were produced purporting to be from the Gadza River. The report was fully investigated and the area thoroughly but unsuccessfully searched for more, and it is concluded that the flies were brought from some other area. The reasons prompting natives to make these false reports are quite simple. They know that when an area is cleared of fly it is possible that the line of shooting might be advanced, and they do not wish to give up their rifles and thus lose their supply of meat; nor are they willing to leave their present habitations to follow the fly.

The position west of the Umniati River in the Sebungwe District remains the same as last year, no evidence of any advance of Tsetse having come to light.

The native population of the Sanyati Reserve has now risen to 729 and the number of cattle to 535, besides goats and donkeys. No case of animal trypanosomiasis has been reported anywhere in the area.

**Sebungwe.**

The general fly position remained unchanged. On the Nagupande, Chebira, Malindi and Sengwa Rivers, *G. morsitans* is still found in moderate numbers. South of these localities only very occasional Tsetse are found, and most of these have been in situations such as make the possibility of their having been carried a real one. A careful search in December failed to detect Tsetse on the Golongola River, but it is too early yet to say that they have finally disappeared from this river. Again no Tsetse were found on the Mzola River or anywhere else south of the Mkulugusi belt. In this District also there was very marked game movement due to the drought, resulting in a, probably temporary, scattering of *G. morsitans* towards the end of the dry season. A total of six specimens of this Tsetse were caught on the Bemsee, Kawindi, Sipoli and Kanyandavu Rivers, which lie south of the main area of distribution, in October. At this time game also concentrated on the Mzola River, but despite a thorough search no Tsetse were found in their vicinity.

The occurrence of *G. pallidipes* at Chenga on the Nagupande River, discovered in 1942, was verified in December. *G. pallidipes* is also known to be present near the junction of the Sebungwe and Maseme Rivers, north of the area of present operation.

The destruction of game has been intensified during the year by increasing the number of hunters, in an effort more rapidly to render the area north of the Mzola River safe for cattle. The effects of this intensification are not yet apparent, possibly because of the abnormal dry season and also probably because this intensification has not yet been in operation for a long enough period to have any visible effect.

A second Ranger has been appointed and is established at the Sengwa Gorge to supervise operations in the eastern part of the area, which had perforce been to some extent neglected because of the size of the area.

A picket has been established at the Nagupande Drift on the main road from the Ranger's camp at Lusulu to Gwaai Bridge. This has been necessitated by an increase in the amount of traffic on this road. Otherwise the danger of transporting Tsetse from the area north of the Nagupande River to the cattle on the Karna Block or even further afield would be considerable.

Blood smears were taken from all 27 of the cattle at Pashu's Kraal in February. Six of these showed the presence of trypanosomes. The cattle appear to be resistant animals as no deaths were reported during the year. The animals suffered from drought, however, and in December smears were taken from 11 of the worst looking animals. None of these showed the presence of trypanosomes. Other than these cattle in the west, there are now present in the Sebungwe District 8,345 head of cattle compared with 7,416 head in 1948. No cases of trypanosomiasis occurred in any of these cattle though, as in 1948 some of them are close to the present Tsetse Fly limit. There was no suspicion of trypanosomiasis in any of the cattle on the south bank of the Kana River, (Shangani District), reclaimed country immediately to the south of our present operations.

### Mtoko.

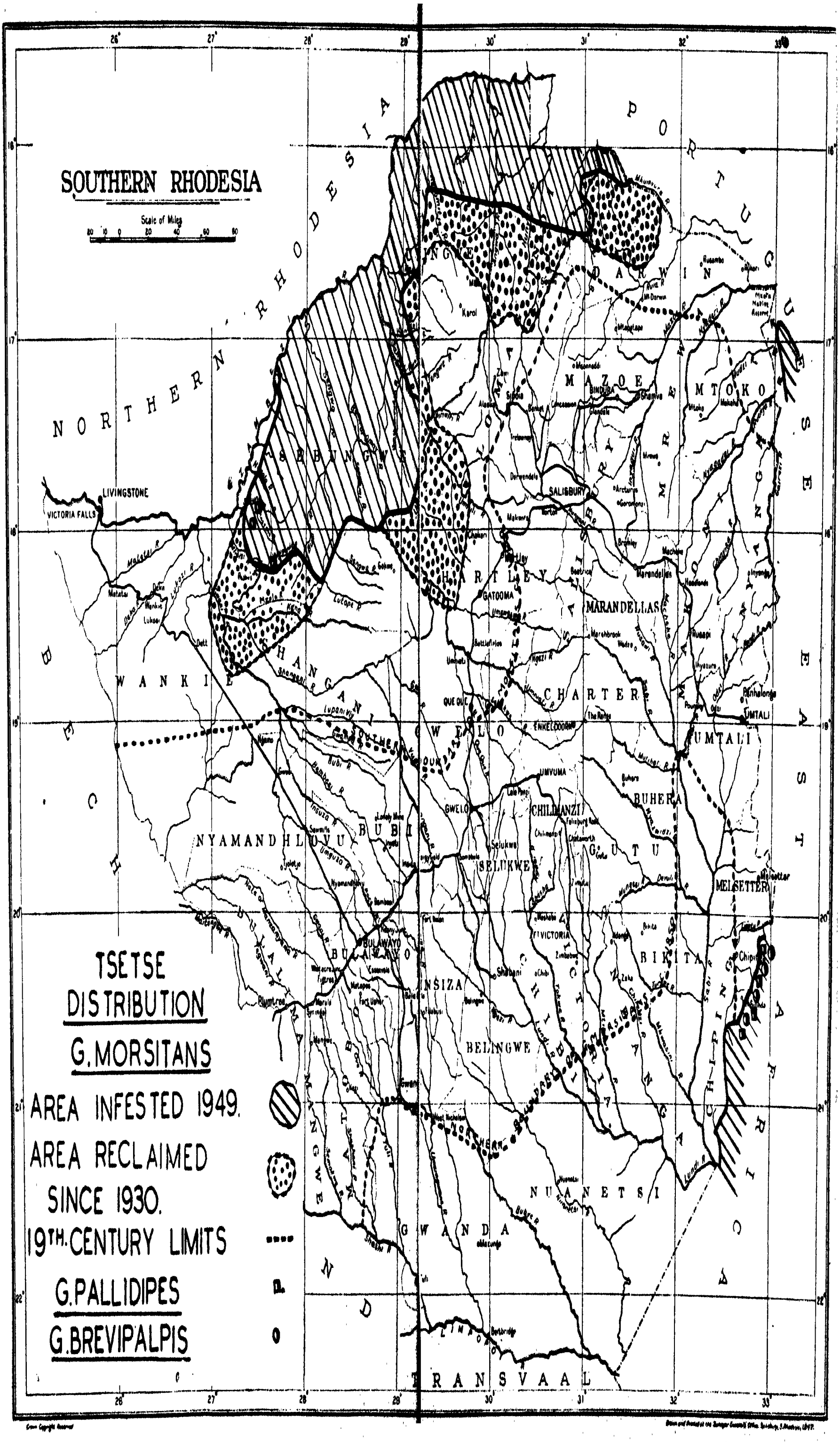
No major outbreak of animal trypanosomiasis corresponding to that occurring in 1948 was reported during 1949 in the Mkota Reserve. Twenty-one deaths definitely attributable to trypanosomiasis occurred, compared with over 100 in 1948. Treatment of infected kraals with dimidium bromide continued and a number of cattle known to have trypanosomiasis recovered as a result. Blood smears were examined by the Veterinary Research Laboratory from 10 per cent. of the animals in the Reserve and trypanosomiasis was found to be present in 19 of 84 kraals, representing an infection of probably less than 1 per cent. of the total cattle in the Reserve.

The control of elephant in the area continued, and 30 were destroyed during the year.

Early in the year an experienced native was stationed close to the border for about a month. He examined traffic coming from Portuguese East Africa, and also travelled on the Uleri lorries using the Border-Changara road to see if he could find any evidence of the transport of Tsetse into Southern Rhodesia by traffic. He found no Tsetse at all during this investigation.

As a result of the joint survey made in 1948 in collaboration with the Portuguese Missao de Combate às Thipanosomíases, the Portuguese authorities have now begun control measures on their side of the border. At the end of the year they put into operation a fly-chamber on the road between Changara and the border, and they have undertaken game control in the area since the middle of the year.

As in 1948, no cases of trypanosomiasis were reported from the Chikwizo Native Reserve.



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Drawn and Printed at the Surveyor General's Office, Salisbury, S. Rhodesia, 1947.

**Eastern Border (Chipinga).**

Eighty-seven positive cases of animal trypanosomiasis, involving 19 farms, were diagnosed during 1949. This number does not differ significantly from the number (96) diagnosed in 1948, but their distribution was rather different in that more than twice as many farms were involved in 1949, of which many reported only one case. The principal outbreak was on Mount Silinda where 27 cases were reported early in the year. This was probably due to native-owned cattle straying across the clearing to the Tsetse infested Portuguese side and bringing fly or infection back with them. A little extra clearing was done in the presumed area of infection, and the situation was brought under control by treatment of animals by the Veterinary Department. No cases attributable to this outbreak occurred after June. On the group of farms Lettie Swan, Stirling, Confidence and Pendragon, there was no recurrence of the rather severe outbreak of 1948, 25 cases (the same number as in 1947) being reported, as against 85 in 1948. No cases were reported North of the Lusitu River.

During the year 82 (111)* Tsetse were caught in and near the border clearing in the normal course of Tsetse Fly Operations. In addition, a further 62 (0) flies were caught in January close to the border clearing in Portuguese territory, not in the course of normal operations but by a new Ranger learning the habits of Tsetse. Only 4 (7) of the Tsetse were caught in Southern Rhodesian territory, and all of these were close to the Portuguese border.

Of the total number 45 (88) were caught in traps, namely, 2 (19) *G. morsitans* and 43 (69) *G. pallidipes*. The remaining 37 (23) caught on man or while resting on paths comprised 7 (8) *G. pallidipes*, 26 (2) *G. brevipalpis*, and 4 (3) *G. morsitans*, and of the four caught in Southern Rhodesia 2 (4) were *G. pallidipes*, 2 (1) *G. brevipalpis*, and 0 (2) *G. morsitans*.

Owing to the progressive easing, referred to last year, of the work of maintaining the clearing, it was possible to do more new clearing amounting in all to just over 3,000 acres on the farms Mount Silinda, Mayfield, Wolverhampton, Vermont and Pendragon. In addition, regrowth was cut back on almost the whole of the main and subsidiary clearings. This work was carried out with a lesser number of natives and for most of the year with only two European Rangers, and the total cost was lower in spite of the rise in price of certain essential commodities and in wages. A good burn of the whole main and subsidiary clearings was obtained in September and October, the forests of Chirinda and Chipete having been effectively protected by fire-guards.

**Sabi Valley.**

In order to ascertain whether it would yet be advisable to reintroduce cattle into the Northern part of this area adjoining the Portuguese border, a Tsetse Survey was carried out in Portuguese territory North of the Ndanga River. *G. morsitans* was found to be abundant on the Chingera River and less numerous on the Murongwesi River, and at Madiningana Salt Pan. The Nyadonga River was found to be free from fly and here a considerable number of cattle were located. Blood smears taken from these cattle did not show the presence of trypanosomiasis. A few cattle are kept near the Murongwesi River. One of these had recently died and a smear from another showed the presence of *T. congolense.* It was thus decided that it would not be advisable to introduce cattle into the neighbourhood of the Musaswe River.

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* Figures in parentheses are the comparable figures for 1948.

South of this area the heavy concentration of *G. morsitans* about the Honde and Ndanga Rivers in Portuguese East Africa persists. Two Tsetse were caught in Southern Rhodesia, both close to the Rupembe River, a few yards from the Portuguese border. No cases of trypanosomiasis have been reported in Southern Rhodesia in this area.

## TRAFFIC CONTROL.

Two new traffic cleansing pickets were established during the year. One of these is situated at the Midway Mine at the top of the Zambesi escarpment on the newly-made road from Nzoe Mine to Chipisa Mine. This picket is to prevent Tsetse from being brought up the escarpment into the Urungwe Native Reserve. A barrier has also been placed near the Nagupande drift on the road from the Tsetse Fly Ranger's camp at Lusulu (Sebungwe District) to Gwaai Bridge, to eliminate the possibility of Tsetse being carried to the cattle on the Karna Block and further west. No records have been kept at this point. The other four control points, all in the Urungwe District, remain, but the fly-chamber at Vuti fell into such a bad state of repair that its use was discontinued in December, and it was replaced by a gate. A new chamber is in course of construction for erection at Makuti.

The following traffic was examined at the Urungwe District control points:—

**Vuti Chamber.**

| | |
|---|---|
| 2,913 motor cars, bringing ...... | 14 fly (11 male, 3 female) |
| 1,161 pedestrians, 304 cyclists (541 parties), bringing ...... | 3 fly ( 3 male, 0 female) |
| Total ...... | 17 fly (14 male, 3 female) |

Compared with 1940 (25); 1941 (67); 1942 (49); 1943 (56); 1944 (27); 1945 (29); 1946 (23); 1947 (20); 1948 (11).

**Catkin Chamber.**

| | |
|---|---|
| 320 motor cars, bringing ...... | 18 fly (15 male, 3 female) |
| 1,744 pedestrians, 696 cyclists (1,044 parties), bringing ...... | 73 fly (53 male, 20 female) |
| Total ...... | 91 fly (68 male, 23 female) |

Compared with 1944—5 months only—(15); 1945 (61); 1946 (37); 1947 (28); 1948 (34).

**Makuti Gate.**

| | |
|---|---|
| 2,992 motor cars, bringing | 782 fly ( 576 male, 206 female) |
| 1,415 pedestrians, 672 cyclists (1,125 parties), bringing | 936 fly ( 736 male, 200 female) |
| Total | 1,718 fly (1,312 male, 406 female) |

Compared with 1944—4 months only—(100); 1945 (562); 1946 (703); 1947 (764); 1948 (504).

**Chirundu Gate.**

| | |
|---|---|
| 2,393 motor cars, bringing | 466 fly (365 male, 101 female) |
| 1,020 pedestrians, 175 cyclists (363 parties), bringing | 192 fly (144 male, 48 female) |
| Total | 658 fly (509 male, 149 female) |

Compared with 1940 (360); 1941 (119); 1942 (276); 1943 (746); 1944 (437); 1945 (485); 1946 (incomplete, 319); 1947 (211); 1948 (214).

**Midway Barrier** (6 months only).

| | |
|---|---|
| 235 motor cars, bringing | 40 fly ( 28 male, 12 female) |
| 5,121 pedestrians, 124 cyclists (1,353 parties, bringing | 130 fly ( 84 male, 46 female) |
| Total | 170 fly (112 male, 58 female) |

An explanation for the marked increases in fly caught is offered earlier in this report.

Contributing to the increase has also been the increase of about 40 per cent. in traffic at all stations, as compared with 1948.

# Some Notes on the Water Act, as amended, 1949

By P. H. HAVILAND, B.Sc., M.I.C.E.,
Director of Irrigation.

## General.

The Water Act (Chapter 251, Revised Edition of the Statute Law, 1939), was amended in a number of major directions by the Water Amendment Act No. 8 of 1949, and in certain minor ways by the Water Amendment Act No. 34 of 1947. It is probable that many farmers and others are not aware of the effect of these amendments, and so a few notes on the Act as now in force may be of value. In submitting these notes, it must be made quite clear that **they do not constitute legal rulings, nor are they comprehensive, and are prepared only for the general guidance of the public.**

The Act may be said to control the use of water in such a way as to achieve the most beneficial effects to the Colony as a whole, and is essentially modern in its framework.

## Water Vested in Governor.—Rights Attach to Land.

All water other than "private water" is vested in the Governor, NOT the Government, and its use, diversion and apportionment is controlled by the terms of the Act.

All water rights attach to the land and not to any individual.

## Private Water.

"Private Water" is defined as water which naturally rises, falls or drains on to any land, provided such water is not naturally capable of entering any water-course of natural origin. This virtually confines "private water" to water in lakes, to springs from which the flow disappears before it can reach any natural water-course and to water in vleis which cannot have any effect, direct or indirect, on the flow of any stream; consequently it can be said that there is practically no private water in the Colony.

## Public Stream—Public Water.

A "public stream" is a water-course of natural origin in which water flows in ordinary seasons, whether or not the water-course is dry during any period of the year. "Public water" is any water in a public stream, and it is this water which is controlled in a practical form by the Water Act.

## Primary Use.

It is important to know what is meant by "primary use." This is the use of water for human use or in or about a dwelling, and also the use of water for the support of animal life. The amount of water, other than that required for animals, is limited to 50 gallons per day for each person resident in a dwelling, and no riparian owner, tenant or occupier is permitted to use any water in excess of this. The total quantity of water is, therefore, calculated at 50 gallons per day multiplied by the number of persons in a dwelling, irrespective of colour or race, and may be used on gardens, for water-borne sewage purposes or anything else.

If it is necessary, water for the support of animal life may be impounded in dams or may be diverted for the purpose **by riparian** owners, tenants or occupiers, but the water so impounded or diverted must not be more than is essential.

### Secondary or Irrigation Use.

The use of water for irrigation purposes, that is, "secondary use," can only be effected after a right has been granted by a Water Court.

### Tertiary Use.

The "tertiary use" of water can only be resorted to after a Water Court has granted the right. "Tertiary use" of water is the use for any purpose **except** primary, secondary, mining, railway and urban purposes, and it includes the use of water for general conservation and for fish farming.

### Mining Use.

The rights which prospectors or the holders of mining locations have under the Mines and Minerals Act, in respect of the use of water for primary purposes or in respect of subterranean water or water directly due to rainfall before it joins a public stream, are preserved under the Water Act.

Any person requiring water for mining purposes may be granted it by a Water Court.

If such water is being used beneficially for irrigation by some other person under a right granted in terms of the Water Act or any other law, a Water Court may grant the miner's application but only on payment of compensation to the person to whose land the irrigation right attaches. The compensation payable is limited to 75 per cent. of the full extent of the loss or damage suffered as a result of the deprivation of the use of the water for irrigation.

The rights to the use of water attach to the claims and pass with any transfer of claims, but upon abandonment or forfeiture of the claims these rights lapse.

### Railway and Urban Use.

Special provisions exist in the Act for the granting of water rights for railway and for urban purposes.

Railway rights can be obtained **only by a person, partnership or company authorised by law** to construct or operate a railway.

Urban rights can be obtained **only by a local authority.**

### Riparian Owners', Tenants' and Occupiers' Rights.

A "riparian owner," that is, the owner of land on which or along the boundary of which there is a public stream, has certain advantages over a non-riparian owner. In the first place, he has the right, without any reference to a Water Court, to impound, divert or take any public water for "primary use," and this right extends also to any occupier or tenant of riparian land. Secondly, he has, unless it is otherwise in the public interest, a prior claim over non-riparian owners to be allocated by a Water Court public water for irrigation or other purposes; non-riparian owners can only obtain these rights if the water is not being beneficially used by riparian owners or if a Water Court, after considering a recommendation by the Minister, is satisfied that the use of water by a non-riparian owner is in the public interest.

### Rights of Public.

As travellers and other persons may require public water for the immediate purpose of watering stock, drinking, washing or cooking, or use in a vehicle, the Act provides that they may take such water at any time provided they have legal access to the public stream, which in general means that they may use the water if on a public road, outspan, etc,; these persons, however, have no right to divert or abstract this water for "primary use."

### Priority of Right of Use.

If at any time there is insufficient water in a public stream to satisfy all the rights to the use of water which exist on that stream, then the order in which they must be satisfied is:—

(1) all primary rights;
(2) rights to the use of water for irrigation purposes;
(3) rights to the use of water for tertiary purposes.

Within the category of irrigation purposes no holder of rights may make use of these rights **until the rights of prior holders have been satisfied.** If an upper riparian owner has a right with a priority later than some lower riparian owner, then he must allow to pass down the river such an amount of water as is necessary for the lower owner's requirements before he attempts to satisfy his own rights.

A similar position applies within the category of tertiary rights.

### Failure to Use Rights.

If the holder of any right to the use of water for secondary or tertiary purposes does not make full use of the rights for three consecutive years, a Water Court may cancel the rights or reduce them unless the holder can satisfy the Court that the failure to use them or to use them fully was not due to his fault or neglect.

**It is essential** that all returns relating to the use of water sent out by the Water Registrar be returned expeditiously and **completed accurately.**

### Servitudes.

Any person who has been granted the right to the use of water may claim certain servitudes over the land of another, if it is essential to the enjoyment of the right. Such servitudes are those necessary to store water, to enable its passage over or under land, or to build storage works or erect pumping plant on another's land. If no agreement is come to between the parties, then a Water Court will adjudicate on the matter. The procedure for making claims for servitudes is detailed in the Act.

A servitude may be acquired by agreement between parties, but such a servitude, if not registered, is binding **only on the original parties** to the agreement, and if one of the parties dies, disposes of his land or otherwise ceases ownership, the agreement is null and void.

It is most desirable, therefore, that the agreement should be registered on the title of all land against and in favour of which servitude has been acquired.

Registration is effected through the Water Registrar who will inform applicants as to what is required which, among other things, includes the submission of copies of a diagram of the servitude areas framed by a Government land surveyor or a Government irrigation engineer.

**No Final Grants will be issued in future where servitudes are required unless such servitudes have been obtained.**

### Applications for Use of Water.

Forms of application for each particular use of water are obtainable from the Water Registrar, Department of Justice, Salisbury.

Completion of Forms must be done carefully and **all information** asked for must be given.

When the Registrar has received the form, and provided it is completed correctly, he publishes a notice in the "Gazette" calling for any objections to the application to be lodged within a period stated in the notice.

At the same time he calls for reports from the Chief Hydrographic Engineer and the appropriate Circle Engineer of the Irrigation Department and when necessary reports from the Department of Conservation and Extension in relation to land use.

### Hearing of Cases.

The Water Court operates on circuits, visiting different parts of the Colony at different times of the year.

A notice is published annually in the "Gazette" giving the month when the Court will sit at various centres, and the dates by which applications must be received by the Water Registrar. **Applications put in after these dates will not be accepted for the normal circuits.**

### Completion of Works.

When a Court deals with an application it issues a Provisional Order, which order provides for the use of water until the completion of all the works and conservation measures which are necessary to the issue of a Final Grant. In this Provisional Order the period in which the works and measures must be completed is stated.

Should, for good cause, an applicant not be able to complete the works within the time specified he may apply to the Water

Registrar for an extension of time and, in doing so, must submit an affidavit sworn before a Justice of the Peace or Commissioner of Oaths as to the reasons for the delay.

If the Water Court, or if a Court is not sitting the Water Court Judge, is satisfied that the reasons are sound an extension of time, as considered reasonable by the Court or Judge, may be given.

### Final Grants.

Before a Final Grant can be issued by the Water Registrar a certificate has to be submitted by an officer of the Irrigation Department stating that all the works and measures stipulated in the Provisional Order have been completed.

**It is essential,** therefore, that holders of Provisional Orders should **complete all** these works and measures within the time specified or as extended.

### Storage of More than One Million Gallons.

A new section in the Act makes it obligatory on any person who intends to construct a storage work holding more than one million gallons to notify the Director of Irrigation in writing of the details of the work, unless the safety of the work has been considered by a Water Court. This does NOT mean that the Director can authorise the storing of the water or the use of the water. The storage and use of water is authorised only with the authority of a Water Court un'ess it is for primary use, and, if the latter, the onus is on the person building the work to ensure that only sufficient is stored for his "primary" requirements, including such water as is necessary to offset evaporation and other natural losses.

### Sub-Division of Land with Rights Attached.

If any land in respect of which water rights have been granted, or any "scheduled irrigable land" in a combined Irrigation Scheme, is sub-divided under an agreement between the seller and purchaser providing for an apportionment of the existing water rights, **this agreement will have no force unless and until it is approved of by a Water Court.**

If no agreement is made, a Water Court, either on its own motion or after an application is made by any interested party, may make such an apportionment of the existing rights as appears to be reasonable to it.

Prospective purchasers and sellers are advised to bear this matter in mind.

### Disputes Between Users.

If there is any dispute regarding the use, diversion, control or appropriation of water, the matter can be brought before a Water Court. Should, however, the parties to the dispute so desire, a dispute may be referred to a Water Court Judge, and if the parties agree beforehand, his award can be made final and conclusive. A new provision also makes it possible for a dispute to be referred to the Director of Irrigation, and his award will be binding on the parties unless or until it is set aside either by agreement between the parties or by order of a Water Court.

**Offences.**

It is advisable that the public should know something about the offences and penalties under the Water Act, and the following is the applicable extract:—

"122. Any person who, without lawful right or authority (the proof whereof shall lie upon him)—

(a) alters, enlarges or obstructs an irrigation work, or destroys, defaces or moves any level mark, beacon or other structure or appliance erected or made in connection with such work;

(b) impounds, diverts or takes any public water;

(c) interferes with or alters the flow of or pollutes or fouls the water of an irrigation work or of a public stream or interferes with the distribution of such water, or, after notice to refrain from doing so, takes more water than he is entitled to, or uses it in a manner contrary to this Act or the regulations made thereunder;

(d) while using or being liable for the maintenance of an irrigation work, to the prejudice of others wastes or does not take due precaution to prevent the waste of water from such work, or fails properly to maintain the work and keep it in repair;

(e) wastes the water of a public stream;

(f) being the proprietor of an area, after notice from the Minister or other official authorised by him, fails to put an end to waste of water resulting from the act of a tenant or other person deriving rights from such proprietor and no longer present on such area;

(g) aids or abets or knowingly permits any such act or default; or

(h) constructs any well, shaft, borehole or other work or does any other thing which is intended to have the effect of abstracting public water or water lawfully diverted or stored by any other person;

(i) interferes with the bed, banks or course of a public stream or any swamps or marshes forming the source of a public stream or found along its course;

(j) contravenes or fails to comply with any bye-law made in terms of section seventy nine of this Act;

shall be guilty of an offence, and liable—

(i) in the case of a first conviction, to a fine not exceeding twenty-five pounds, or in default of payment to imprisonment for a period not exceeding six months, or to both such fine and such imprisonment;

(ii) in the case of a second or subsequent conviction, to a fine not exceeding one hundred pounds, or in default of payment to imprisonment for a period not exceeding one year, or to both such fine and such imprisonment.

123. Any person who wilfully or maliciously commits any of the acts mentioned in paragraphs (a) and (b) of the last preceding section shall be liable to a fine not exceeding five hundred pounds, or to imprisonment for a period not exceeding two years, without the option of a fine.

123A. Any person who, except under and in accordance with the written permission of the Director of Irrigation, places any poison in any **public or private water** shall be guilty of an offence and shall be liable to a fine not exceeding five hundred pounds or to imprisonment for a period not exceeding two years.

124. Any person who commits an offence against this Act or any regulation made thereunder, for which no penalty is expressly provided, shall be liable to a fine not exceeding twenty-five pounds, or in default of payment to imprisonment for a period not exceeding six months.

125. (1) Whenever any person is convicted by a court of an offence against this Act or the regulations made thereunder, and it appears that such person has by that offence caused damage to any person, such court may, at the written request of such person, but in the presence of the convicted person, enquire summarily and without pleadings into the amount of damage so caused.

(2) Upon proof of such amount, such court shall give judgment therefore in favour of the applicant and against the convicted person, and such judgment shall be of the same force and effect and be executable in the same manner as if it had been given in a civil action duly instituted before such court:

Provided that judgment shall not be given under this section for a sum exceeding the civil jurisdiction of such court."

**Reporting Offences.**

The commission of offences should be reported to the Police for appropriate action and NOT to the Water Registrar or Irrigation Department.

It might, however, be advisable to notify the Irrigation Department of any offences **reported.**

# Productivity and Nutritive Value of Star Grass Pastures

By H. WEINMANN, Dr.Agric.,D.Sc., Pasture Research Chemist.

Star grass (*Cynodon plectostachyum Pilger*) seems to be one of the most promising fodder grasses for the granite sandveld areas of high rainfall in this Colony. At the Marandellas Grassland Research Station, Star grass pastures have given excellent results for a number of years, and Staples (9) considers that "the carrying capacity of these planted pastures appears to be as much as five times that of natural veld." Investigators in East Africa (1, 2), the homeland of this species, as well as in Australia (7, 8) and India (6) have favourably commented on the nutritive value and productivity of strains of this grass.

The present work was carried out at the Marandellas Grassland Research Station, and included investigations on the seasonal growth and chemical changes of two strains of Star grass (known as Star grass No. 2 and No. 4), and on the effect of different amounts of ammonium sulphate on the yield and chemical composition of Star grass No. 2. The properties of these grasses and methods of their establishment, etc., have been discussed by Rattray (5). Of the two varieties Star grass No. 2 is more suitable for grazing, and No. 4 for hay-making. The soil at the Marandellas Research Station is an acid granitic sand of low fertility, an analysis of which has been given in a previous paper (10). The annual rainfall during the period over which this investigation extended was 45.8 inches in 1947/48, 27.7 inches in 1948/49, and 27.6 inches in 1949/50.

## SEASONAL GROWTH AND CHEMICAL CHANGES.

In December, 1947, two half-acre plots of Star grass No. 2 and No. 4 were established. The runners were planted in holes three feet by three feet apart, and a double handful of compost was mixed into each hole. 200 lb. of superphosphate per acre had been applied before planting, and 50 lb. of ammonium nitrate were given soon afterwards. The grass made good growth and produced a satisfactory cover during the same season. The herbage was cut on 13th May, 1948. The dry matter yields and chemical composition are shown in Table I.

TABLE I.

## YIELDS AND CHEMICAL COMPOSITION OF STAR GRASS (13th May, 1948).

**Results of the chemical analysis expressed on the dry basis.**

| Strain | Yield lb. p. acre | Protein % | Ash Acid-sol. % | $P_2O_5$ % | $K_2O$ % | CaO % |
|---|---|---|---|---|---|---|
| Star Grass No. 2 ...... | 4,360 | 7.1 | 5.9 | 0.74 | 2.8 | 0.54 |
| Star Grass No. 4 ...... | 4,520 | 5.7 | 4.3 | 0.60 | 1.8 | 0.44 |

In the 1948/49 season one-half of each plot was fertilised (NP), receiving 200 lb. of super-rockphosphate mixture (1:1) plus 100 lb. of sodium nitrate per acre in November, 1948, and a further dressing of 100 lb. of sodium nitrate on 4th March, 1949. The other half of each plot remained unfertilised (0). Between November, 1948, and June, 1949, two quadrats of two yards by two yards area were cut in each treatment at the beginning of each month, new quadrats being cut every time. The quadrats cut in January were cut again in May, and those cut in December were cut again in March and June. The samples were used for the determination of the dry matter yields as well as for chemical analysis. During the winter months random samples were taken which were analysed for protein.

The grasses flowered in January and February, the No. 2 strain being in advance of No. 4, and also forming more flower heads. By the beginning of May the herbage was rather mature and yellowish, but Star grass No. 2 retained some green leaves until the beginning of August.

**Dry Matter Yields, 1948/49.** The results of the yield determinations are given in Table II. While the seasonal growth figures show some irregular fluctuations, obviously due to sampling errors, they nevertheless indicate consistently higher yields for the fertilised plots. With one cut per season dry matter yields amounted to 1 to 1½ tons per acre, but with two cuts total yields exceeding two tons of dry matter per acre were obtained in the fertilised plots.

**Chemical Composition of the Herbage, 1948/49.** The results of the chemical analysis are shown in Tables III and IV. The percentages of protein, acid-soluble ash, phosphoric oxide and potash decreased with the advance of the season, while the lime content remained more or less constant or showed even an increase towards the end of the season. As will be seen from Fig. 1, the protein content was fairly high (nearly 15%) in the young herbage but dropped to 5-6% during the months of November and December, i.e., during the period of most rapid growth, after which time the decrease was only a gradual one. The application of nitrogenous fertiliser raised the percentage of protein and also produced a herbage of darker green colour, but the differences usually did not last for more than two months. In the protected grass the protein content had dropped to 4% and less by the beginning of June, but herbage cut previously in December and March contained still more than 5% (and in one case more than 6%) of protein. The rainfall was low in this season, particularly the months of January and February being very dry, and it is thought that this resulted in a rapid maturation of the herbage and hence in a relatively low protein content. It should also be mentioned that these samples included not only shoots but also stolons (runners) and, as will be shown below, stolons, especially when old, are considerably lower in protein than shoots.

The phosphoric oxide content of the two strains of Star grass ranged from about 1.3 to 0.4%, and the lime content from 0.75 to 0.4%; in the herbage cut at three-monthly intervals the phosphoric oxide content averaged 0.7% and lime 0.6%. The mineral content of Star grass thus compares very favourably with that of ordinary veld grass, in which phosphoric oxide and lime content usually vary from 0.2 to 0.4% of the dry matter.

TABLE II.

**YIELDS OF STAR GRASS, 1948/49 SEASON.**

**In pounds dry matter per acre.**

| Date | Star Grass No. 2 | | Star Grass No. 4 | | Rainfall* |
|---|---|---|---|---|---|
| | O | NP | O | NP | ins. |
| SEASONAL GROWTH | | | | | |
| 5/11/1948 | 590 | — | 470 | — | 5.09 |
| 3/12/1948 | 1,140 | 1,360 | 850 | 1,260 | 7.93 |
| 4/1/1949 | 2,360 | 3,050 | 2,080 | 2,650 | 4.50 |
| 1/2/1949 | 1,700 | 2,150 | 2,115 | 3,430 | 2.65 |
| 1/3/1949 | 2,220 | 3,390 | 2,720 | 3,040 | 2.79 |
| 1/4/1949 | 2,230 | 2,870 | 2,310 | 3,010 | 3.95 |
| 3/5/1949 | 2,140 | 3,020 | 3,100 | 3,860 | 0.33 |
| 1/6/1949 | 2,240 | 3,100 | 2,680 | 3.170 | 0.30 |
| TWO CUTS PER SEASON (JANUARY AND MAY) | | | | | |
| 4/1/1949 | 2,360 | 3,050 | 2,080 | 2,650 | — |
| 3/5/1949 | 1,550 | 1,600 | 1,720 | 2,240 | — |
| Total | 3,910 | 4,650 | 3,800 | 4,890 | — |
| THREE CUTS PER SEASON (DECEMBER, MARCH AND JUNE) | | | | | |
| 3/12/1948 | 1,140 | 1,360 | 850 | 1,260 | — |
| 1/3/1949 | 1,600 | 1,850 | 1,730 | 1,950 | — |
| 1/6/1949 | 510 | 870 | 420 | 610 | — |
| Total | 3,250 | 4,080 | 3,000 | 3,820 | — |

* For month preceding respective sampling date.

**Protein Content of the Herbage in 1949/50.** All old herbage was removed from the plots in September, 1949. The fertiliser treatments were continued during this season, but the amounts of nitrogen were doubled as compared with those used in the previous year. 100 lb. of super-rockphosphate mixture per acre were given on 15th December, 1949; 200 lb. of sodium nitrate were applied on 16th December, 1949, and again on 3rd March, 1950. No yield determinations were done during this season but random samples of herbage were taken at monthly intervals from December, 1949, to May, 1950, and were analysed for protein. The results are indicated in Table V.

Rains were late in this season, and the first samples taken at the beginning of December were of very young herbage and hence very high in protein. Though January was again a dry month, the total rainfall was higher than in 1948/49. The seasonal protein curves are very similar to those of the preceding year, showing again a rapid decline in the first part of the growing season but remaining at a somewhat higher level. As might be expected, the effect of the nitrogenous fertiliser was more pronounced than in the previous seasons when only half the amount of sodium nitrate had been used.

## TABLE III.

## SEASONAL CHANGES IN THE CHEMICAL COMPOSITION OF STAR GRASS, 1948/49.

**Constituents as Percentages of the Dry Matter.**

| Sampling Date | Star Grass No. 2 |  | Star Grass No. 4 |  |
|---|---|---|---|---|
|  | O | NP | O | NP |
| PROTEIN |  |  |  |  |
| 5/11/1948 | 14.61 | — | 14.82 | — |
| 3/12/1948 | 6.90 | 9.00 | 10.92 | 12.11 |
| 4/1/1949 | 4.63 | 5.15 | 5.82 | 6.42 |
| 1/2/1949 | 5.10 | 5.05 | 5.87 | 5.98 |
| 1/3/1949 | 4.88 | 4.89 | 4.67 | 4.83 |
| 1/4/1949 | 4.85 | 5.66 | 5.01 | 6.87 |
| 3/5/1949 | 3.79 | 5.43 | 3.52 | 4.01 |
| 1/6/1949 | 3.61 | 4.33 | 3.36 | 3.03 |
| 5/7/1949 | 3.81 | 4.43 | 3.29 | 3.56 |
| 2/8/1949 | 3.44 | 3.78 | 2.87 | 3.06 |
| 6/9/1949 | 3.02 | 3.48 | 2.83 | 2.95 |

### ACID-SOLUBLE ASH

| | | | | |
|---|---|---|---|---|
| 5/11/1948 | 7.98 | — | 7.10 | — |
| 3/12/1948 | 5.67 | 6.10 | 5.29 | 5.64 |
| 4/1/1949 | 4.24 | 4.39 | 3.77 | 4.36 |
| 1/2/1949 | 3.83 | 3.85 | 3.47 | 3.81 |
| 1/3/1949 | 3.89 | 4.28 | 3.05 | 3.44 |
| 1/4/1949 | 3.49 | 4.45 | 2.92 | 3.28 |
| 3/5/1949 | 3.21 | 4.25 | 2.35 | 2.54 |
| 1/6/1949 | 2.82 | 3.31 | 2.23 | 2.27 |

### PHOSPHORIC OXIDE

| | | | | |
|---|---|---|---|---|
| 5/11/1948 | 1.33 | — | 0.79 | — |
| 3/12/1948 | 1.05 | 0.92 | 0.78 | 0.99 |
| 4/1/1949 | 0.67 | 0.59 | 0.59 | 0.68 |
| 1/2/1949 | 0.54 | 0.68 | 0.63 | 0.67 |
| 1/3/1949 | 0.52 | 0.77 | 0.57 | 0.68 |
| 1/4/1949 | 0.57 | 0.87 | 0.63 | 0.57 |
| 3/5/1949 | 0.53 | 0.85 | 0.45 | 0.42 |
| 1/6/1949 | 0.43 | 0.51 | 0.43 | 0.46 |

### POTASH

| | | | | |
|---|---|---|---|---|
| 5/11/1948 | 3.79 | — | 3.61 | — |
| 3/12/1948 | 2.79 | 3.03 | 2.55 | 2.69 |
| 4/1/1949 | 2.09 | 2.65 | 1.92 | 2.14 |
| 1/2/1949 | 1.76 | 1.84 | 1.57 | 1.85 |
| 1/3/1949 | 1.71 | 1.86 | 1.33 | 1.47 |
| 1/4/1949 | 1.45 | 1.79 | 1.11 | 1.29 |
| 3/5/1949 | 1.19 | 1.62 | 0.80 | 0.90 |
| 1/6/1949 | 0.79 | 1.09 | 0.65 | 0.56 |

### LIME

| | | | | |
|---|---|---|---|---|
| 5/11/1948 | 0.60 | — | 0.54 | — |
| 3/12/1948 | 0.43 | 0.55 | 0.51 | 0.59 |
| 4/1/1949 | 0.39 | 0.47 | 0.44 | 0.45 |
| 1/2/1949 | 0.51 | 0.49 | 0.51 | 0.53 |
| 1/3/1949 | 0.61 | 0.73 | 0.53 | 0.58 |
| 1/4/1949 | 0.60 | 0.73 | 0.56 | 0.49 |
| 3/5/1949 | 0.59 | 0.75 | 0.50 | 0.56 |
| 1/6/1949 | 0.68 | 0.71 | 0.50 | 0.60 |

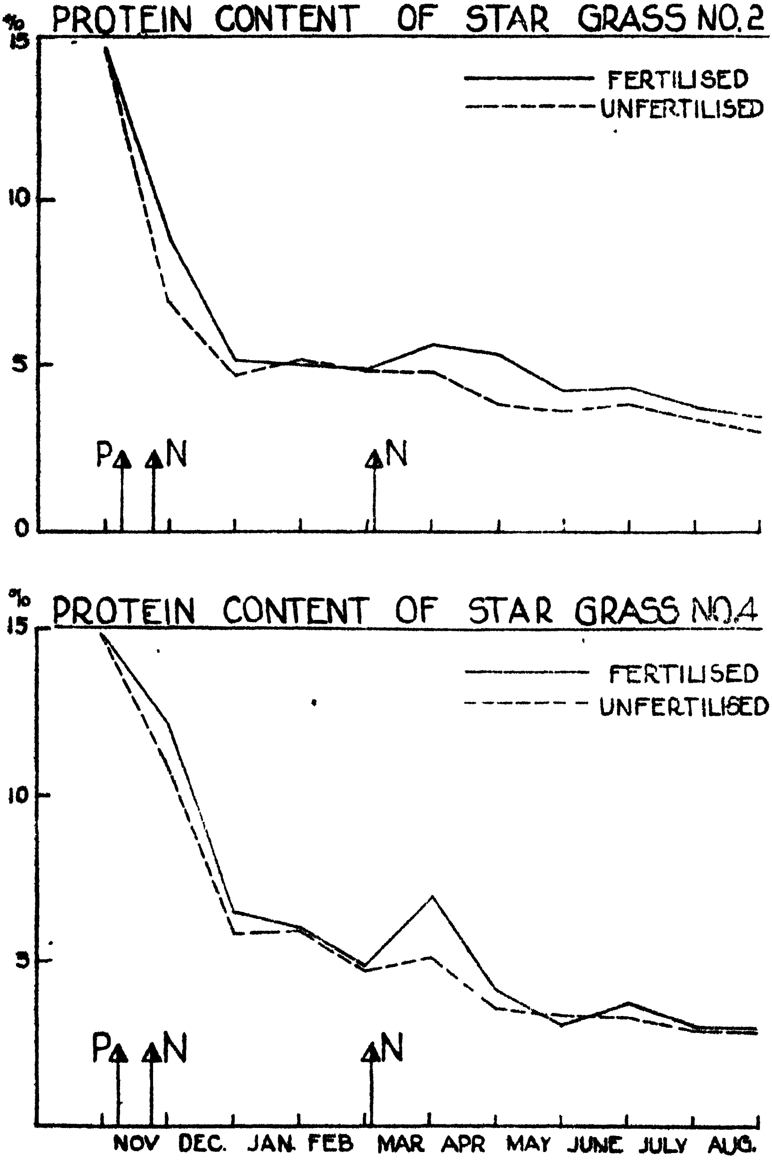

Fig. 1.—Seasonal Trends of the Protein Content of Star Grass (1948-49.) (The dates of application of phosphate and sodium nitrate are indicated by arrows.)

Sheep on a Star Grass pasture in its fourth year on Grassland Research Station, Marandellas. These pastures have been found particularly useful in maintaining the flock through the dry season months.

[Photographed by Mr. C. K. Thompson.

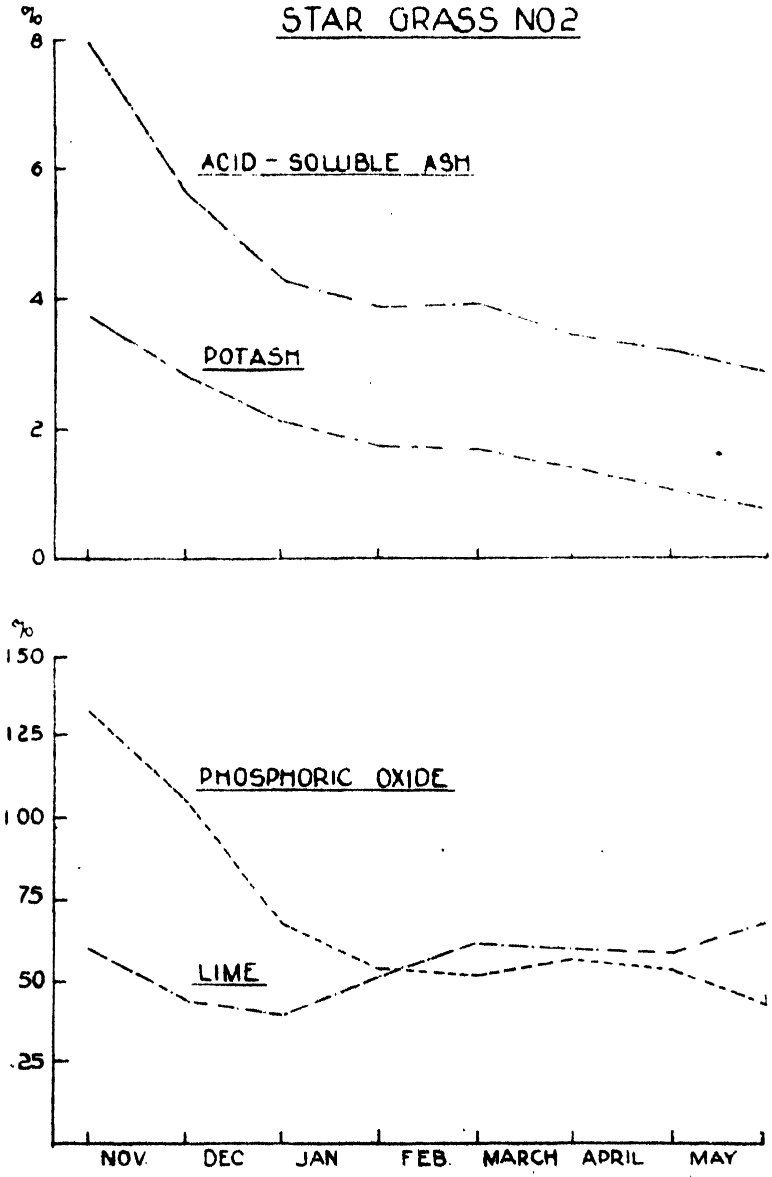

Fig. 2.—Seasonal Changes in the Mineral Content of Unfertilised Star Grass No. 2 (1948-49).

## TABLE IV.

## CHEMICAL COMPOSITION OF STAR GRASS CUT TWICE OR THREE TIMES PER SEASON (1948/1949).

**Constituents as Percentages of the Dry Matter.**

| Sampling Date | Star Grass No. 2 O | Star Grass No. 2 NP | Star Grass No. 4 O | Star Grass No. 4 NP |
|---|---|---|---|---|
| **Two Cuts per Season (January and May).** | | | | |
| PROTEIN | | | | |
| 4/1/1949 | 4.63 | 5.15 | 5.82 | 6.42 |
| 3/5/1949 | 4.60 | 6.20 | 4.12 | 4.89 |
| Average | 4.62 | 5.68 | 4.97 | 5.66 |
| ACID-SOLUBLE ASH | | | | |
| 4/1/1949 | 4.24 | 4.39 | 3.77 | 4.36 |
| 3/5/1949 | 3.74 | 4.28 | 2.76 | 3.18 |
| Average | 3.99 | 4.34 | 3.27 | 3.77 |
| PHOSPHORIC OXIDE | | | | |
| 4/1/1949 | 0.67 | 0.59 | 0.59 | 0.68 |
| 3/5/1949 | 0.70 | 0.66 | 0.49 | 0.50 |
| Average | 0.69 | 0.63 | 0.54 | 0.59 |
| POTASH | | | | |
| 4/1/1949 | 2.09 | 2.65 | 1.92 | 2.14 |
| 3/5/1949 | 1.67 | 1.85 | 1.09 | 1.19 |
| Average | 1.88 | 2.25 | 1.51 | 1.67 |
| LIME | | | | |
| 4/1/1949 | 0.39 | 0.47 | 0.44 | 0.45 |
| 3/5/1949 | 0.57 | 0.67 | 0.55 | 0.57 |
| Average | 0.48 | 0.57 | 0.50 | 0.51 |
| **Three Cuts per Season (December, March and June).** | | | | |
| PROTEIN | | | | |
| 3/12/1948 | 6.90 | 9.00 | 10.92 | 12.11 |
| 1/3/1949 | 4.94 | 5.70 | 5.21 | 5.04 |
| 1/6/1949 | 5.89 | 6.67 | 5.38 | 5.48 |
| Average | 5.91 | 7.12 | 7.17 | 7.54 |

| | | | | |
|---|---|---|---|---|
| | | ACID-SOLUBLE ASH | | |
| 3/12/1948 | 5.67 | 5.10 | 5.29 | 5.64 |
| 1/3/1949 | 4.67 | 4.50 | 3.59 | 3.95 |
| 1/6/1949 | 4.38 | 4.37 | 2.95 | 3.52 |
| Average | 4.91 | 4.99 | 3.94 | 4.37 |
| | | PHOSPHORIC OXIDE | | |
| 3/12/1948 | 1.05 | 0.92 | 0.78 | 0.99 |
| 1/3/1949 | 0.88 | 0.76 | 0.58 | 0.77 |
| 1/6/1949 | 0.63 | 0.56 | 0.41 | 0.51 |
| Average | 0.83 | 0.75 | 0.59 | 0.76 |
| | | POTASH | | |
| 3/12/1948 | 2.79 | 3.03 | 2.55 | 2.69 |
| 1/3/1949 | 1.97 | 2.03 | 1.61 | 1.71 |
| 1/6/1949 | 1.79 | 1.67 | 1.24 | 1.48 |
| Average | 2.18 | 2.24 | 1.80 | 1.96 |
| | | LIME | | |
| 3/12/1948 | 0.43 | 0.55 | 0.51 | 0.59 |
| 1/3/1949 | 0.53 | 0.58 | 0.46 | 0.50 |
| 1/6/1949 | 0.72 | 0.84 | 0.47 | 0.51 |
| Average | 0.56 | 0.66 | 0.48 | 0.53 |

## TABLE V.

### SEASONAL CHANGES IN THE PROTEIN CONTENT OF STAR GRASS, 1949/50.

**Crude Protein as Percentage of the Dry Matter.**

| Date | Star Grass No. 2 O | Star Grass No. 2 NP | Star Grass No. 4 O | Star Grass No. 4 NP | Rainfall* ins. |
|---|---|---|---|---|---|
| 1/12/1949 | 17.30 | — | 23.40 | — | 2.80 |
| 4/1/1950 | 8.26 | 11.96 | 8.40 | 12.40 | 8.58 |
| 1/2/1950 | 6.04 | 6.42 | 5.41 | 7.34 | 2.60 |
| 28/2/1950 | 6.35 | 6.52 | 7.24 | 7.37 | 5.14 |
| 30/3/1950 | 6.34 | 7.51 | 6.09 | 8.04 | 6.53 |
| 27/4/1950 | 5.44 | 5.75 | 4.52 | 5.82 | 1.69 |

* For month preceding respective sampling date.

**General Conclusions.** The results of these investigations indicate that the protein content of Star grass No. 2 and No. 4 is very high when the grass is young, but rapidly drops during the first part of the growing season, and then more slowly during maturation. Repeated cutting and applications of nitrogenous fertiliser kept the protein content at a somewhat higher level. The phosphorus and lime content of the two strains of Star grass was at all stages of growth superior to that of indigenous veld grasses. It remained to be seen, to what extent the quality and productivity of the Star grass could be improved by the use of larger applications of nitrogenous fertilisers combined with suitable pasture management.

## EFFECT OF AMMONIUM SULPHATE ON A STAR GRASS PASTURE.

In 1949 it was decided to lay out a fertiliser experiment in a pasture of Star grass No. 2 at the Marandellas Grassland Research Station. This pasture had been established in March, 1947, when the Star grass was planted under a maize-bean silage crop. The pasture was grazed from November, 1947, onward, though with certain rest periods. Apart from 100 lb. of rockphosphate per acre, applied in 1947/48, no fertiliser had been used on the pasture before the present experiment was laid out.

In March, 1949, 14 plots of five yards by five yards each were pegged off, which were to receive the following fertiliser treatments:—

| | | Pounds per Acre | |
|---|---|---|---|
| | | Superphosphate | Ammonium Sulphate |
| (1) | O | - | - |
| (2) | P | 200 | - |
| (3) | NP | 200 | 100 |
| (4) | $N_2P$ | 200 | 200 |
| (5) | $N_4P$ | 200 | 400 |
| (6) | $N_6P$ | 200 | 600 |
| (7) | $N_8P$ | 200 | 800 |

Each of these treatments was represented by two plots. The phosphate was applied on 4th March, 1949; the mode of application of the various ammonium sulphate treatments during the 1948/49 season is indicated in the following plan:—

**Lb. Ammonium Sulphate per Acre Applied in 1948/49.**

| Treatment | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|
| 4/3/1949 | 100 | 200 | 200 | 200 | 200 |
| 29/3/1949 | — | — | 200 | 200 | 200 |
| 12/4/1949 | — | — | — | 200 | 200 |
| 2/5/1949 | — | — | — | — | 200 |
| Totals | 100 | 200 | 400 | 600 | 800 |

## PROTEIN CONTENT OF STAR GRASS No. 2, AUTUMN AND WINTER, 1949.

The pasture, including the plots of this experiment, was grazed by cattle at the end of March, 1949; soon afterwards the experiment was fenced. The plots on which ammonium sulphate was applied produced a darker green herbage and more flower heads than those which received no nitrogen. Frosts were late and light in 1949, and the herbage had many green leaves even as late as July. Samples of herbage were taken from the plots on 1st June and 5th July, and the protein content of the total herbage as well as of shoots and stolons was determined (see Table VI).

### TABLE VI.

### CRUDE PROTEIN CONTENT OF STAR GRASS No. 2, AUTUMN AND WINTER, 1949.

**As Percentage of the Dry Matter.**

| Treatment | O | P | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|---|---|
| | | | TOTAL HERBAGE | | | | |
| 1/6/1949 | 4.48 | 4.29 | 4.11 | 5.16 | 5.40 | 6.11 | 6.54 |
| 5/7/1949 | 5.00 | 3.75 | 5.56 | 4.20 | 5.48 | 5.29 | 5.86 |
| | | | SHOOTS | | | | |
| 1/6/1949 | 6.73 | 6.39 | 6.95 | 7.43 | 8.36 | 8.47 | 9.60 |
| 5/7/1949 | 5.98 | 5.11 | 5.40 | 6.10 | 6.55 | 6.75 | 7.39 |
| | | | STOLONS | | | | |
| 1/6/1949 | 1.79 | 1.63 | 2.00 | 2.08 | 2.31 | 2.38 | 2.44 |
| 5/7/1949 | 2.00 | 1.78 | 1.93 | 2.05 | 2.64 | 2.82 | 2.67 |

As will be seen, the protein content of the total herbage as well as of shoots and stolons increased with the rate of application of ammonium sulphate, but the shoots were approximately three times as high in protein as the stolons. In the plots where 800 lb. of ammonium sulphate per acre had been applied the shoots contained as much as 9.6% of protein at the beginning of June and still 7.4% one month later.

## INVESTIGATIONS DURING THE 1949/50 SEASON.

During this season yield cuts were taken on 4th January, 1st March and 28th April, 1950, a quadrat of two yards by two yards being harvested in each plot but in a different plot portion at each sampling date. Dry matter yields, protein, phosphorus and lime content of the herbage were determined, and for the last sampling date also the relative proportions of shoots and stolons in four of the treatments. After each cut cattle were admitted for grazing until all plots were evenly grazed down; in January only three steers were available for grazing, and it was necessary afterwards to cut down the herbage evenly.

The superphosphate (200 lb. per acre) was given on 31st October, 1949, the ammonium sulphate was applied, as indicated in the following table:—

**Lb. Ammonium Sulphate per Acre Applied in 1949/50.**

| Treatment | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|
| 31/10/1949 | 100 | 100 | 100 | 200 | 200 |
| 29/11/1949 | — | — | 100 | 100 | 200 |
| 19/1/1950 | — | 100 | 100 | 100 | 100 |
| 1/2/1950 | — | — | 100 | 100 | 100 |
| 3/3/1950 | — | — | — | 100 | 100 |
| 31/3/1950 | — | — | — | — | 100 |
| Totals | 100 | 200 | 400 | 600 | 800 |

**Dry Matter Yields.** The results of the yield determinations are shown in Table VII and Fig. 3. While the use of phosphate alone had no effect on the herbage yields, these increased markedly with increased applications of ammonium sulphate. The differences were particularly pronounced in the first cut, the larger applications of nitrogen producing a luxurious growth of the Star grass. Considering the combined yields from all three cuts, 400 lb. of ammonium sulphate per acre more than doubled the herbage yield, while 800 lb. more than trebled it. The proportion of stolons (runners) in the herbage appeared to be appreciable only in the last cut, varying from 1/3rd to 1/5th of the total herbage. The application of nitrogen seems to have reduced the proportion of stolons to some extent.

## TABLE VII.

### YIELDS OF STAR GRASS No. 2, 1949/50.

**In Pounds Dry Matter per Acre.**

| Treatment | O | P | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|---|---|
| 4/1/1950 | 930 | 820 | 1,470 | 1,420 | 2,410 | 3,270 | 4,360 |
| 1/3/1950 | 640 | 650 | 800 | 1,290 | 1,720 | 1,860 | 1,980 |
| 28/4/1950 | 1,100 | 1,030 | 1,360 | 1,300 | 1,610 | 2,070 | 2,430 |
| Totals | 2,670 | 2,500 | 3,630 | 4,010 | 5,740 | 7,200 | 8,770 |

**Shoots and Stolons as Percentages of Total Dry Matter Yields (28/4/1950).**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Shoots | 72.2 | 66.5 | — | — | 75.2 | — | 81.0 |
| Stolons | 27.8 | 33.5 | — | — | 24.8 | — | 19.0 |

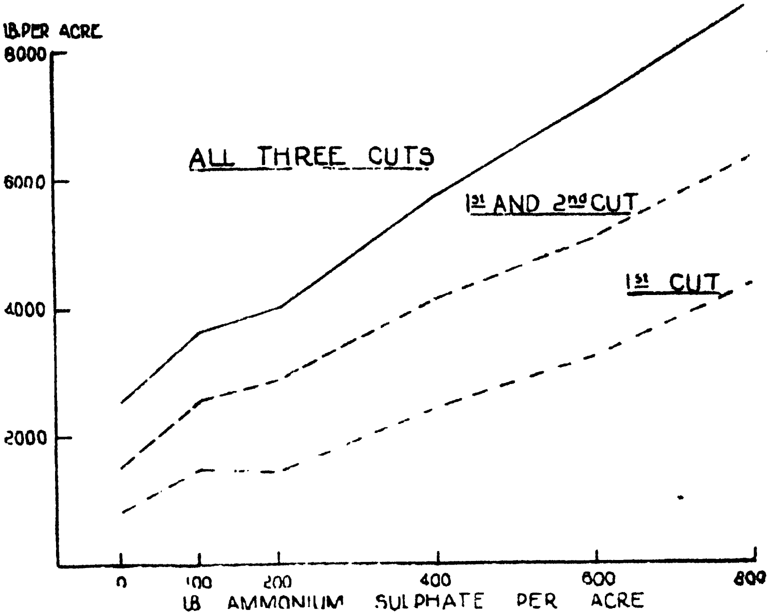

Fig. 3.—Dry Matter Yields of Star Grass No. 2 in Relation to Amount of Ammonium Sulphate Applied (1949-50).

TABLE VIII.

## CHEMICAL COMPOSITION OF STAR GRASS No. 2, 1949/50.

**Constituents as Percentages of the Dry Matter.**

| Treatment | O | P | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|---|---|
| | | | CRUDE PROTEIN | | | | |
| 4/1/1950 .. .... | 6.35 | 6.29 | 6.83 | 6.98 | 8.50 | 10.10 | 11.30 |
| 1/3/1950 .. . .. | 8.75 | 8.27 | 8.33 | 8.38 | 10.90 | 10.92 | 12.16 |
| 28/4/1950 ...... .. .. | 5.28 | 5.72 | 5.58 | 5.94 | 6.45 | 6.58 | 7.62 |
| Totals* ..... ..... | 6.48 | 6.58 | 6.68 | 7.08 | 8.65 | 9.30 | 10.50 |
| | | | PHOSPHORIC OXIDE | | | | |
| 4/1/1950 .. . .... | 0.54 | 0.64 | 0.57 | 0.59 | 0.56 | 0.52 | 0.51 |
| 1/3/1950 ..... .. . | 0.64 | 0.83 | 0.66 | 0.64 | 0.66 | 0.58 | 0.60 |
| 28/4/1950 ..... ..... | 0.47 | 0.62 | 0.46 | 0.47 | 0.38 | 0.37 | 0.38 |
| Totals* ...... ...... | 0.52 | 0.68 | 0.55 | 0.57 | 0.54 | 0.49 | 0.50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | LIME | | | | |
| 4/1/1950 | 0.48 | 0.53 | 0.50 | 0.54 | 0.51 | 0.47 | 0.41 |
| 1/3/1950 | 0.48 | 0.51 | 0.45 | 0.48 | 0.44 | 0.49 | 0.43 |
| 28/4/1950 | 0.46 | 0.51 | 0.47 | 0.45 | 0.49 | 0.50 | 0.45 |
| Totals* | 0.48 | 0.52 | 0.48 | 0.49 | 0.48 | 0.49 | 0.43 |
| CRUDE PROTEIN CONTENT OF SHOOTS AND STOLONS (28/4/1950) | | | | | | | |
| Shoots | 6.95 | 7.49 | — | — | 7.55 | — | 8.35 |
| Stolons | 2.40 | 1.99 | — | — | 2.35 | — | 2.93 |

* The percentages of protein, phosphoric oxide and lime for the total yields (combined yields from the three cuts) have been calculated from the total dry matter yields (Table VII) and the total nutrient yields (Table IX). For instance, % protein for the O-Treatment

$$= \frac{173.0 \times 100}{2,670} = 6.48.$$

**Chemical Composition.** According to the results of the chemical analysis (see Table VIII), the protein content of the herbage increased also in this season with the amount of nitrogen applied, reaching 10% and more with the larger applications of ammonium sulphate. The phosphorus content was highest where phosphate only had been applied, and was slightly reduced by large applications of ammonium sulphate. The lime content varied only little but was also highest in the herbage of the P-treatment and lowest with the highest nitrogen dressing. As in the previous year, the shoots were greatly superior to the stolons in their protein content.

**Total Nutrient Yields.** The calculation of the total yields of nutrients in lb. per acre gives a more complete picture of the total fertiliser effect than the separate consideration of the yields and chemical composition of the herbage. The total yields of protein, phosphoric oxide and lime in the combined herbage from the three cuts are shown in Table IX and Fig 4.

## TABLE IX.

## TOTAL NUTRIENT YIELDS IN POUNDS PER ACRE.

### Star Grass No. 2, 1949/50.

| Treatment | O | P | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|---|---|
| Crude Protein | 173.0 | 164.3 | 242.6 | 284.1 | 495.9 | 669.0 | 920.0 |
| Phosphoric Oxide | 14.0 | 17.0 | 19.9 | 22.7 | 30.9 | 35.5 | 43.5 |
| Lime | 12.7 | 12.9 | 17.3 | 19.7 | 27.8 | 34.9 | 37.4 |

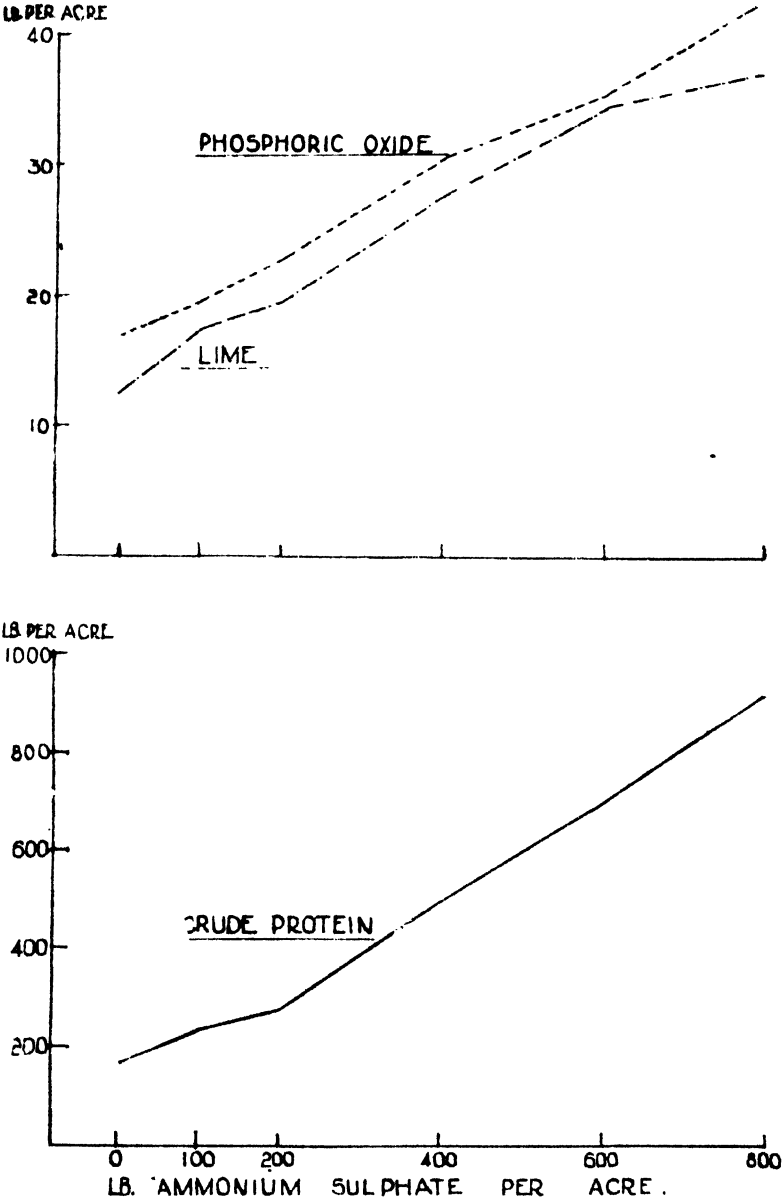

Fig. 4.—Nutrient Yields of Star Grass No. 2 in Relation to Amount of Ammonium Sulphate Applied (1949-50).

As will be seen, the yields of protein as well as of phosphorus and lime greatly increased with the amount of ammonium sulphate applied. In the plots which had received phosphate plus 400 lb. of ammonium sulphate per acre the total yield of protein was approximately three times as high as in the unfertilised control, while the yields of phosphorus and calcium were doubled. With 800 lb. of ammonium sulphate the yield of protein was more than five times, and that of phosphorus and lime three times as high as without fertiliser treatment.

**Palatibility of the Herbage.** Whenever cattle were admitted to the experiment for grazing, they immediately approached the plots which had received the larger dressings of ammonium sulphate (i.e., 400 lb. per acre and more) and grazed them in preference of the other plots, the herbage of which was eaten only after the heavily fertilised plots had been depleted. The behaviour of the amimals in this respect was essentially the same at all times of the season, and there can be little doubt that the use of large dressings of nitrogenous fertiliser improved the palatibility of the herbage.

**Soil Acidity.** That the continuous use of ammonium sulphate may increase the acidity of the soil has been demonstrated by previous work in South Africa (4). On 27th April, 1950, soil samples were taken from each plot of this experiment to a depth of about three inches, and their pH was determined. The averages for the various treatments are given, as follows:—

### pH of Surface Soil.

| Treatment | O | P | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|---|---|
| pH ...... . . . . | 6.1 | 5.8 | 5.5 | 5.4 | 5.0 | 4.8 | 4.8 |

As shown by these figures, there was a very distinct increase in the soil acidity with an increase in the amounts of ammonium sulphate used. Dressings of 600 and 800 lb. of ammonium sulphate per acre reduced the pH to the value of 4.8, while the soil of the unfertilised control had a pH of 6.1. Such increased soil acidity can naturally be remedied by the use of agricultural lime, and whenever larger amounts of ammonium sulphate are used for several years, checking of the soil acidity is required from time to time. This is particularly important in the case of grass leys, since subsequent agricultural crops with an optimum pH higher than that of grasses may suffer more severely from the acidity than the grass itself. Such a condition will not arise if instead of ammonium sulphate certain other nitrogenous fertilisers are used on acid soils of this type, such as ammonium nitrate, which does not affect the soil reaction at all, or nitrate of soda, which has the property of neutralising soil acidity. The same applies to rock phosphate, which can be used in place of, or in combination with, superphosphate.

## DISCUSSION.

The foregoing data will have shown that Star grass, when properly managed and provided with an adequate supply of fertilisers, can form pastures of very high productivity. In Table X the dry matter and nutrient yields of Star grass No. 2 are compared with those of ordinary veld. While such results naturally vary from year to year and also for different regions, the comparison nevertheless indicates how vastly superior in productivity Star grass pastures can be to natural veld.

### TABLE X.

### COMPARISON OF VELD HERBAGE AND STAR GRASS.

**Dry Matter and Nutrient Yields in Pounds per Acre.**

| | Veld Herbage* | | Star Grass No. 2 | | |
|---|---|---|---|---|---|
| | Grasses only | Grasses & Herbs | O | $N_4P$ | $N_8P$ |
| Dry Matter | 1,080 | 1,890 | 2,670 | 5,740 | 8,770 |
| Crude Protein | 61.6 | 144.7 | 173.0 | 495.9 | 920.0 |
| Phosphoric Oxide | 3.4 | 5.9 | 14.0 | 30.9 | 43.5 |
| Lime | 4.2 | 12.5 | 12.7 | 27.8 | 37.4 |

* Results of Marandellas experiments in 1947/48; totals for two cuts per season; the herbs are largely unpalatable (11).

The question will be asked: Is the use of such large amounts of fertilisers economic? It is attempted to answer this question on the basis of the data presented in the foregoing sections.

### TABLE XI.

**Economics of Fertiliser Applications.**

| Treatment | NP | $N_2P$ | $N_4P$ | $N_6P$ | $N_8P$ |
|---|---|---|---|---|---|
| GROSS RETURN DUE TO FERTILISER TREATMENT | | | | | |
| Lb. Protein per Acre* | 70 | 111 | 323 | 496 | 747 |
| Monetary Value† | 38/- | 60/- | 174/- | 268/- | 403/- |
| FERTILISER COSTS PER ACRE | | | | | |
| Superphosphate | 24/- | 24/- | 24/- | 24/- | 24/- |
| Ammonium Sulphate | 29/- | 58/- | 116/- | 174/- | 232/- |
| Totals | 53/- | 82/- | 140/- | 198/- | 256/- |
| VALUE OF NET GAINS PER ACRE | | | | | |
| Loss (–) or Profit (+) | –15/- | –22/- | +34/- | +70/- | +147/- |

* Protein yield of respective treatment minus protein yield of unfertilised control.

† 100 lb. of protein valued at 54/-.

In Table XI the costs and returns for the various fertiliser treatments are shown (excluding the phosphate-only treatment, which resulted in a clear loss economically, since it did not produce any yield increase). The fertiliser costs are based on the prices ruling in 1950, f.o.r., Salisbury, plus an additional 30s. per ton to cover expenses of railage, transport to and on the farm, and spreading. No allowance has been made for the costs of establishing the pasture, management, fencing, etc. These expenses would be roughly the same for all treatments, particularly if the pasture is used for grazing only, though when cut for hay the expenses will increase with the bulk of hay to be handled. The return from the plots was calculated from the yields of protein in excess of the unfertilised control. The monetary equivalent of the protein yields was assessed in the following way: Of the existing commercial roughages, bean hay is the one most comparable to Star grass hay. Bean hay is sold at a producer price of £6 10s. (and more) per ton. Since it contains as an average 12% of crude protein, 100 lb. of protein in the form of bean hay cost 54s., and this figure was used to calculate the monetary value of the protein yields in Table XI.† While no exact comparative data regarding the relative feeding values of the protein in Star grass and bean hay are available, it may be mentioned that French in Tanganyika (1) found that the digestibility coefficient of Star grass protein was 70-75%, which is of the same magnitude as that of legume hay (3). From the results given in Table XI it appears that the use of 100 and 200 lb. of ammonium sulphate in combination with 200 lb. of superphosphate per acre resulted in a financial loss. However, larger quantities of ammonium sulphate produced significant gains which increased with the amount of nitrogen applied. Since there was no diminishing of returns, it is likely that larger applications would have given even bigger returns.

It is emphasised that these figures are presented with due reservation, since they are derived from a small-scale experiment and the results of one season only. More work, using large-scale grazing experiments, in which returns will be measured in terms of beef or milk production, will be necessary to substantiate the present conclusions. It is, however, considered that with proper grazing management even better results will be obtained, since the grazing animal returns a large proportion of the removed nutrients to the pasture in the form of manure. In addition, the beneficial effect that such grass leys have on subsequent agricultural crops through the building-up of soil structure, organic matter and fertility must be considered.

## SUMMARY.

This paper reports the results of certain investigations, carried out at the Marandellas Grassland Research Station and dealing with the seasonal growth and chemical changes in Star grass (*Cynodon plectostachyum Pilger*), and the effect of different amounts of ammonium sulphate on a Star grass pasture.

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† 100 lb. of protein in the form of oil cake cost approximately 50s. at the present time.

In protected Star grass (Strains No. 2 and No. 4) the percentages of protein, acid-soluble ash, phosphoric oxide and potash decreased with the advance of the season, while the lime content remained more or less constant or showed an increase towards the end of the season. The protein content was high in the young grass but dropped rapidly during the period of maximum growth; applications of nitrogenous fertiliser and repeated cutting raised the protein content of the herbage. The phosphorus and lime content of the two strains of Star grass was at all stages of growth superior to that of indigenous veld grasses.

A fertiliser experiment was laid out on an established pasture of Star grass No. 2, in which amounts of ammonium sulphate varying from 100 to 800 lb. per acre were applied annually, together with 200 lb. of superphosphate.

While phosphate alone had no effect on the yields, these increased markedly with increased applications of ammonium sulphate which also raised the protein content of the herbage and improved its palatability.

The total yields of crude protein, phosphoric oxide and lime (in lb. per acre) greatly increased with the amount of ammonium sulphate applied. With 800 lb. of ammonium sulphate plus 200 lb. of superphosphate per acre, the yield of protein was five times, and that of phosphorus and lime three times, as high as without fertiliser treatment.

The results of this work indicate that well-fertilised Star grass pastures are vastly superior in productivity to ordinary veld, and calculations are presented which indicate that the use of larger quantities of ammonium sulphate (400 lb. per acre and more) is economic.

The acidity of the soil was found to increase with the quantity of ammonium sulphate applied, and the use of agricultural lime (in conjunction with ammonium sulphate) or of other nitrogenous fertilisers in place of ammonium sulphate is recommended on acid soils of this type.

## ACKNOWLEDGMENTS.

Thanks are due to Mr. J. M. Rattray, Senior Pasture Research Officer, Marandellas Grassland Research Station, and his Staff for help and co-operation in the field work.

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# Southern Rhodesia Veterinary Report

FOR THE MONTH OF JUNE, 1950.

**General.**

Grazing deteriorated in all Districts. With the exception of the Melsetter District water was scarce and drought conditions prevailed in many areas. Cattle remained in fair condition.

**Tick Life.**

With the exception of the Umtali and Fort Victoria Districts, tick life was reported to be very active. The following quarantine notices were issued during the month: Salisbury 7, Bulawayo 16, Gwelo 14.

**Scheduled Diseases.**

1. African Coast Fever: Nil.
2. Theileriosis: Reported in the Salisbury and Melsetter Districts.
3. Anthrax: Nil.
4. Foot and Mouth Disease: A full cordon was established on the Bechuanaland/Southern Rhodesia Border, and four officials of the Department were temporarily seconded to the Bechuanaland Protectorate, to assist with the outbreak of Foot and Mouth Disease there.

   An outbreak was diagnosed and confirmed on Triangle Sugar Estate in the Fort Victoria District. Extensive inspections were made, a cordon placed round the Estate, and all cattle therein inoculated.
5. Glanders or Farcy: Nil.
6. Heartwater: Seven deaths were reported in the Bulawayo District.
7. Lungsickness (Contagious Pleuro Pneumonia of Cattle): Nil.
8. Mange in Horses, Mules, Donkeys and Camels: Nil.
9. Pyaemia or Epizootic Lymphangitis: Nil.
10. Redwater: Cases were reported in all Districts with the exception of Fort Victoria District.
11. Rinderpest: Nil.

12. Swine Erysipelas: Nil.

13. Swine Fever: Nil.

14. Quarter Evil: Cases were reported in all Districts.

15. Tuberculosis: In the Bulawayo District a Friesland Bull imported from the Union of South Africa gave a positive reaction to the tuberculin test; 96 head from Liebigs Ranch, West Nicholson, were found to be infected. In the Umtali District reactors to a test made were isolated for subsequent disposal as slaughter stock.

16. Scab: Nil.

17. Rabies: Nil.

18. Senkobo Disease: Nil.

19. Trypanosomiasis: Occurred in the Mkoto and Urungwe Reserves in the Salisbury District. It is again prevalent in the Chipinga District.

20. Contagious Epididymitis and Vaginitis (Epi-Vag): In the Salisbury District 19 new centres were confirmed. 776 Bulls on 314 farms were inspected, of which 22 Bulls were found to be infected and 8 Bulls under further observation. One farm was released from quarantine.

    In the Bulawayo District one Bull was found to be infected and two Bulls are under further observation.

    A new centre was confirmed at Umvuma in the Gwelo District, where 5 Bulls were found to be infected.

21. Lumpy Skin Disease: A few light cases noted in the Bulawayo and Gwelo Districts.

22. Contagious Abortion: Numerous cases occurred in the Bulawayo District.

**Scheduled Poultry Diseases.**

23. Spirochaetosis: Nil.

24. Coccidiosis: One case occurred in the Salisbury District.

25. Fowl Typhoid: Nil.

26. Bacillary White Diarrhoea: One case was confirmed in the Umtali District.

27. Tuberculosis: Nil.

28. Chicken Pox and Roup: Nil.

## Other Diseases.

29. Gallsickness: Reported in the Salisbury, Bulawayo, Umtali, Gwelo and Melsetter Districts.

30. Paratyphoid: Nil.

31. Horse Sickness: One case reported in the Salisbury and in the Gwelo Districts.

32. Geilsieke: Nil.

33. Biliary: Nil.

34. Sweating Sickness: Six cases reported in the Bulawayo District.

35. Opthalmia: Is prevalent in the Fort Victoria District with a few cases in the remaining Districts.

36. Screw Worm: A few cases occurred in all Districts.

37. Coccidiosis: Nil.

38. Spirochaetosis: Nil.

39. Internal Parasitis: Still responsible for numerous deaths in the Melsetter District.

## Poisoning.

40. Veld Poisoning: Ten deaths were reported in the Bulawayo District and eight deaths in the Umtali District. Cases also occurred in the Gwelo and Melsetter Districts.

41. Mineral Poisoning: Deaths from Arsenical Poisoning were reported in the following Districts: Bulawayo 25; Umtali 2; Melsetter 7. There were 3 cases of suspected Nitrate Poisoning in the Salisbury District and 5 cases of Cyanide Poisoning in the Bulawayo District.

**Mallein Testing:** 120 Horses, 7 Mules and 45 Donkeys tested, with negative results.

**Tuberculin Testing:** 8 Bulls, 44 Cows, 42 Heifers and 8 Yearlings tested, with 1 reactor which was slaughtered.

## IMPORTATION.

**Union of South Africa:** 64 Geldings, 36 Horses and Mares, 7 Mules, 102 Cows and Calves (Breed), and 12 Bulls (Breed).

## EXPORTATION.

**Union of South Africa:** 4 Geldings and 3 Horses and Mares.

**Portuguese East Africa:** 10 Oxen (Slaughter), and 7 Cows and Calves (Breed).

**Northern Rhodesia:** 4 Pigs (Breed), 8 Geldings, 1 Bull (Breed), 11 Cows and Calves (Breed), and 45 Donkeys.

**Nyasaland:** 9 Cows and Calves (Breed).

## EXPORTATION—MISCELLANEOUS.

**Union of South Africa:** 11,942 lbs. Sausage Casings.

**Northern Rhodesia:** 10,641 lbs. ¾ Sides, 6,853 lbs. Middles, 52 lbs. Rolls, 1,278 lbs. Ham, 1,345 lbs. Gammon, 7 lbs. Pie Hams, 2,775 Cooked Shoulders, 1,144 lbs. Sliced Shoulders and 4,300 Smalls.

**Belgian Congo:** 1,150 lbs. Gammon and 382 lbs. Cooked Choulders.

**Bechuanaland Protectorate:** 37 lbs. Middles, 82 lbs. Cooked Shoulders, and 180 lbs. Sliced Shoulders.

**Meat Products from Liebigs (Rhodesia) Ltd., West Nicholson:—**

**Union of South Africa:** 66,000 lbs. Corned Beef, 2,250 lbs. Oxford Sausages, 1,575 lbs. Liver Roll, 7,200 lbs. Steak and Kidney, 15,600 lbs. Braised Steak, 16,800 lbs. Braised Steak and Onion, 3,570 lbs. Potted Meat, 500 lbs. Beef Dripping.

J. E. ADAMSON,
Director of Veterinary Services.

## JULY, 1950

**General.** The scarcity of water continued with resulting deterioration in grazing. Cattle were in fair condition.

**Tick Life.** Tick life was reduced in activity. The following quarantine notices were issued during the month: Salisbury 4, Bulawayo 12, Gwelo 4.

### SCHEDULED DISEASES.

1. **African Coast Fever.**—Nil.

2. **Theileriosis.**—One new centre in the Salisbury District. All farms in the Melsetter District released from quarantine.

3. **Anthrax.**—Reported in the Bulawayo District.

4. **Foot and Mouth Disease.**—Inspections were maintained on the Bechuanaland/Southern Rhodesia border. Further cases were reported in areas adjacent to the original outbreak in the Fort Victoria District and the cordons were suitably extended.

5. **Glanders or Farcy.**—Nil.

6. **Heartwater.**—Reported in the Bulawayo District.

7. **Lungsickness** (Contagious Pleuro Pneumonia of Cattle).—Nil.

8. **Mange in Horses, Mules, Donkeys and Camels.**—Nil.

9. **Pyaemia or Epizootic Lymphangitis.**—Nil.

10. **Piroplasmosis.**—Confirmed on seven farms in the Salisbury District. Nine cases were reported in the Umtali District, and four cases in the Melsetter District.

11. **Rinderpest.**—Nil.

12. **Swine Erysipelas.**—Nil.

13. **Swine Fever.**—Nil.

14. **Quarter Evil.**—Cases were reported in all Districts with the exception of Fort Victoria and Melsetter Districts.

15. **Tuberculosis.**—Reported at West Nicholson in the Bulawayo District. Nine cows imported from the Union of South Africa reacted positively to the test. An eradication scheme is in operation at Umtali.

16. **Scab.**—Reported in two sheep in the Bulawayo District.

17. **Rabies.**—Patrols were instituted in the Beit Bridge area on the Southern Rhodesia/Union of South Africa border.

18. **Senkobo Disease.**—Nil.

19. **Trypanosomiasis.**—Cases were confirmed in the Mtoko and Urungwe Reserves in the Salisbury District, and two cases in the Chipinga District.

20. **Contagious Epididymitis and Vaginitis** (Epi-Vag).—In the Salisbury District three new centres were confirmed and two farms released from quarantine. In the Gwelo District two new centres were confirmed. Cases were also reported at West Nicholson in the Bulawayo District.

21. **Lumpy Skin Disease.**—Nil.

22. **Contagious Abortion.**—Reported in the Salisbury and Bulawayo Districts.

## SCHEDULED POULTRY DISEASES.

23. **Spirochaetosis.**—Nil.

24. **Coccidiosis.**—One case occurred in the Salisbury District.

25. **Fowl Typhoid.**—An outbreak with heavy mortality was reported in the Umtali District.

26. **Bacillary White Diarrhoea.**—Nil.

27. **Tuberculosis.**—Nil.

28. **Chicken Pox and Roup.**—Nil.

## OTHER DISEASES.

29. **Gallsickness.**—Cases were reported in the following Districts: Salisbury 16, Bulawayo 2, Gwelo 3, Melsetter 1.

30. **Paratyphoid.**—Nil.

31. **Horse Sickness.**—One death was reported in the Bulawayo District, and two deaths in the Gwelo District.

32. **Geilsieke.**—Nil.

33. **Biliary.**—Nil.

34. **Sweating Sickness.**—Nil.

35. **Opthalmia.**—Reported to be prevalent in the Salisbury, Bulawayo and Fort Victoria Districts with a few cases in the Umtali, Gwelo and Melsetter Districts.

36. **Screw Worm.**—A few cases occurred in the Salisbury, Umtali and Melsetter Districts.

37. **Coccidiosis.**—An outbreak in calves occurred in the Umtali District.

38. **Spirochaetosis.**—Nil.

39. **Internal Parasitis.**—Causing losses in cattle in the Melsetter District. Heavy infestation was also reported in the Bulawayo District.

## POISONING.

40. **Veld Poisoning.**—Was reported in the Salisbury, Bulawayo, Gwelo and Melsetter Districts.

41. **Mineral Poisoning.**—Cases of Arsenical poisoning were reported in the following Districts: Salisbury 13, Bulawayo 2, Umtali 7, Gwelo 7.

**Mallein Testing.**—64 horses tested with negative results.

**Tuberculin Testing.**—30 bulls, 28 cows and 40 heifers were tested. Four reactors which were slaughtered on the 17/7/50.

## IMPORTATIONS.

**Union of South Africa.**—6 horses and mares, 34 geldings, 12 bulls (breed), 71 cows and calves (breed), 1 goat (breed).

**United Kingdom.**—1 bull (breed).

## EXPORTATIONS.

**Portuguese East Africa.**—25 oxen (slt.), 2 bulls (breed), 23 cows and calves (breed), 3 trek oxen, 1 pig (breed).

**Northern Rhodesia.**—13 bulls (breed), 4 pigs (breed), 12 mules, 11 geldings.

**Belgian Congo.**—3 bulls (breed), 3 horses and mares, 21 geldings, 6 pigs (breed).

**Union of South Africa.**—1 horse and mare, 1 gelding.

## EXPORTATIONS—MISCELLANEOUS.

**Northern Rhodesia.**—¾ sides, 9,278 lb.; middles, 6,866 lb.; rolls, 63; horns, 224 lb.; gammons, 1,956 lb.; cooked shoulder, 3,312 lb.; sliced shoulder, 1,779 lb.; smalls, 3,918 lb.

**Bechuanaland Protectorate.**—Cooked shoulder, 53 lb.; sliced bacon, 96 lb.; smalls, 368 lb.

**Meat products from Liebigs (Rhodesia) Ltd., West Nicholson:—**

**Union of South Africa.**—Potted meat, 5,400 lb.

**Belgian Congo.**—Corned beef, 66,360 lb.; ox tail in jelly, 24 lb.

**Portuguese East Africa.**—Corned beef, 2,700 lb.; Vienna sausages, 300 lb.

J. T. ADAMSON,
Director of Veterinary Services.

# Rhodesian Milk Records

## OFFICIAL MILK RECORDS.

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Inverleith Star Dawn | Jersey | 22 months | 4795.50 | 243.92 | 5.09 | 300 | M. W. Burras, Hertford Farm, Box 443, Bulawayo. |
| Meadow's Wonderful Winsome | Jersey | Sen. 3 years | 7011.00 | 377.42 | 5.38 | 290 | |
| Surguy Jane | Jersey | 2 years | 7249.00 | 338.17 | 4.67 | 300 | |
| Abbotsford Lindberg Geluk | Friesland | 2 years | 4351.00 | 162.77 | 3.74 | 300 | E. W. Butler, "Woodlands," P.O. Shamva |
| Colonies Plaats Amrolla's Grietje III | Friesland | Mature | 9520.00 | 353.20 | 3.71 | 300 | |
| Kingswood Dieukmar Ceres VI | Friesland | 2 years | 7745.50 | 263.00 | 3.40 | 258 | Frogmore Estates, Ltd., M'sonneddi. |
| Dalham Clarice | Jersey | 2 years | 5295.00 | 261.08 | 4.93 | 300 | F. Gebbie, South Lawn, P.B. 42, Marandellas. |
| Dalham Dot | Jersey | Jun. 3 years | 5629.00 | 282.70 | 5.02 | 300 | |
| Fawkham Olive Oil | Jersey | 2 years | 7055.50 | 369.17 | 5.22 | 297 | |
| Dalham Isabella | Jersey | Sen. 4 years | 7979.50 | 385.17 | 4.82 | 300 | S. Gelman, 27, Baxendale St., Bulawayo. |
| Dalham Lena | Jersey | Sen. 4 years | 8673.00 | 418.15 | 4.81 | 300 | |
| Dalham Nina | Jersey | Sen. 4 years | 6371.00 | 318.62 | 3.00 | 270 | |
| Dalham Salandra | Jersey | Jun. 3 years | 7984.50 | 374.04 | 4.68 | 300 | |
| Dalham Selina | Jersey | Mature | 7694.50 | 365.40 | 4.75 | 300 | |
| Gondangdia Mangaria | Jersey | Jun. 3 years | 3928.50 | 160.57 | 4.09 | 275 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Matopo Toss | Red Poll | Mature | 8300.50 | 328.60 | 3.96 | 300 | Government Experiment Station, P.B. 19K, Bulawayo. |
| Matopo Treasure | Red Poll | Mature | 11173.80 | 398.84 | 3.57 | 300 | |
| Matopo Unique | Red Poll | Sen. 4 years | 12193.30 | 421.12 | 3.45 | 300 | |
| Matopo Wren | Red Poll | Jun. 4 years | 6844.60 | 230.62 | 3.37 | 266 | |
| Matopo Vamp | Red Poll | Sen. 4 years | 5111.60 | 207.20 | 4.05 | 300 | |
| Albert Vale Bokwagen XVII | Friesland | Mature | 12416.00 | 404.10 | 3.26 | 300 | J. Jamieson, Criterion Farm, Box 217, Bulawayo. |
| Criterion Rotus's Spinnekop | Friesland | Mature | 9169.00 | 330.68 | 3.61 | 300 | |
| Criterion Susanna II | Friesland | 2 years | 10492.00 | 358.35 | 3.42 | 300 | |
| Gouwsplant Jantje II | Friesland | Mature | 13053.00 | 410.12 | 3.14 | 300 | |
| Prinsloo Hinke | Friesland | Jun. 3 years | 10392.00 | 355.13 | 3.42 | 300 | |
| Prinsloo Sue | Friesland | Jun. 3 years | 10408.00 | 369.43 | 3.55 | 300 | |
| Azana's Amy | Jersey | Mature | 7368.00 | 333.76 | 4.53 | 270 | J. H. Keightley, Moorfields, Glendale. |
| Meadow's Gift IV | Jersey | Mature | 5114.50 | 273.95 | 5.33 | 300 | |
| Meadow's Pioneer Wallflower | Jersey | Mature | 5949.00 | 412.44 | 6.93 | 300 | |
| M'Sasa Jean | Jersey | 2 years | 2962.50 | 178.95 | 6.04 | 240 | |
| Dirko Jong Kapok | Friesland | 2 years | 7373.10 | 277.84 | 3.77 | 300 | A. L. Millar, Estes Park, P.B. 28A, Salisbury. |
| Dirko Lindberg Jong Doring IV | Friesland | 2 years | 5018.30 | 210.70 | 4.20 | 300 | |
| Dirko Marie I | Friesland | 2 years | 6611.10 | 257.56 | 3.90 | 300 | |
| Middeldam Gloria's Lass | Jersey | Jun. 3 years | 5238.00 | 285.99 | 5.47 | 300 | Mrs. E. L. Parkes, Box 159, Salisbury. |
| Middeldam Prim Sybil | Jersey | Mature | 5252.00 | 290.24 | 5.52 | 300 | |
| Neuwied Miranda | Jersey | Mature | 7819.50 | 381.40 | 4.88 | 300 | |
| Albertvale Bokwagon XVI | Friesland | Mature | 5427.50 | 181.78 | 3.35 | 300 | T. C. Pascoe, Crowborough Estate, P.O. Box 1253, Salisbury. |
| Crowborough Charlotte | Friesland | Sen. 3 years | 8069.00 | 287.82 | 3.57 | 300 | |
| Crowborough Clara | Friesland | Jun. 4 years | 7502.00 | 246.74 | 3.29 | 300 | |

## OFFICIAL MILK RECORDS (Continued).

| Name of Cow. | Breed. | Age. | Milk in lbs. | B. Fat in lbs. | Average % B. Fat. | No. of Days. | Name and Address of Owner. |
|---|---|---|---|---|---|---|---|
| Crowborough Clarabel | Friesland | 2 years | 2910.00 | 108.21 | 3.72 | 300 | T. C. Pascoe, Crowborough Estate, Box 1253, Salisbury. |
| Crowborough Daisy | Friesland | Jun. 3 years | 6771.00 | 239.55 | 3.54 | 300 | |
| Mitchlin Beauty's Cecilia | Friesland | Sen. 3 years | 6858.00 | 252.56 | 3.68 | 300 | D. Robertson Synd., Ltd., Hilda's Kraal, P.B. 158R, Bulawayo. |
| Mitchlin Dignity C. II | Friesland | Mature | 8162.50 | 255.10 | 3.13 | 300 | |
| Mitchlin Dignity C. III | Friesland | Jun. 4 years | 8010.50 | 241.67 | 3.07 | 300 | |
| Mitchlin Liberty | Friesland | Mature | 10018.00 | 349.80 | 3.49 | 300 | |
| Mitchlin Lobelia | Friesland | Mature | 9313.00 | 278.25 | 2.99 | 265 | |
| Mitchlin Lobelia's Bess | Friesland | Mature | 11155.00 | 369.17 | 3.31 | 300 | |
| Mitchlin Winona | Friesland | Mature | 10536.00 | 364.19 | 3.46 | 300 | |
| Whinburn Aconite | Friesland | Mature | 14434.10 | 520.24 | 3.60 | 300 | Major R. R. Sharp, Whinburn, Redbank, Bulawayo. |
| Whinburn Daffodil | Friesland | Jun. 3 years | 8729.60 | 275.76 | 3.16 | 300 | |
| Whinburn Damask | Friesland | 2 years | 6750.90 | 218.42 | 3.24 | 300 | |
| Whinburn Dream | Friesland | 2 years | 8387.20 | 272.24 | 3.25 | 300 | |
| Whinburn Dumpling | Friesland | 2 years | 5470.20 | 193.94 | 3.55 | 300 | |
| Whinburn Duty | Friesland | 2 years | 8210.60 | 273.25 | 3.33 | 300 | |
| Whinburn Canny | Friesland | Sen. 3 years | 5252.90 | 202.20 | 3.85 | 251 | |
| Whinburn Cowslip | Friesland | Jun. 4 years | 5981.20 | 192.93 | 3.26 | 300 | |
| Whinburn Polonaise | Friesland | Mature | 13857.70 | 504.23 | 3.72 | 300 | |
| Cambrale's Zinnia | Jersey | Sen. 4 years | 7239.00 | 368.49 | 5.09 | 300 | C. G. Tracey, Handley Cross, P.B. Gatooma. |

## SEMI-OFFICIAL MILK RECORDS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bonny | G. Friesland | 2 years | 6506.00 | 231.85 | 3.56 | 282 | D. A. Allan, "Pendennis" Farm, P.O. Avondale. |
| Alexis | G. Friesland | 3 years | 8835.40 | 307.52 | 3.49 | 259 | B. M. Atkinson, P.O. Box 1404, Salisbury. |
| Kipsand | G. Friesland | Mature | 7286.40 | 245.45 | 3.38 | 300 | |
| Lily | G. Jersey | Mature | 8113.20 | 329.96 | 4.06 | 300 | |
| Margaret | G. Friesland | 3 years | 7912.70 | 280.16 | 3.54 | 300 | |
| Queenie | G. Friesland | 3 years | 7065.50 | 247.57 | 3.49 | 300 | |
| Blossom | G. Friesland | Mature | 7060.00 | 242.53 | 3.44 | 254 | R. A. Ballantyne, P.O. Box 801, Salisbury. |
| Carol | G. Friesland | Mature | 6119.00 | 227.16 | 3.71 | 236 | |
| Thisbe | G. Friesland | 3 years | 5533.00 | 240.49 | 4.35 | 300 | |
| Victoria | G. Friesland | Mature | 6872.00 | 228.47 | 3.32 | 300 | |
| Pride | G. Friesland | Mature | 5900.00 | 227.04 | 3.85 | 300 | N. G. Barrett, Gavenny, P.O. Box 38. Rusape. |
| Charlotte II | G. Shorthorn | 4 years | 5516.50 | 252.90 | 4.58 | 300 | F. J. Barry, Umtassa, Box 209, Umtali. |
| Marina | G. Shorthorn | 3 years | 5492.50 | 263.60 | 4.80 | 300 | |
| Zoolass II | G. Shorthorn | Mature | 6691.50 | 294.15 | 4.40 | 300 | |
| Joy II | G. Shorthorn | Mature | 5676.10 | 236.94 | 4.16 | 300 | J. H. Barry, En Avant, P.B. Umtali. |
| Chemite II | G. Friesland | 3 years | 6567.70 | 250.92 | 3.82 | 300 | J. A. Baxter, Box 1368, Salisbury. |
| Dick | G. Friesland | Mature | 7193.00 | 234.97 | 3.27 | 300 | |
| France | G. Friesland | Mature | 6198.10 | 227.73 | 3.67 | 300 | |
| Margaret | G. Friesland | 4 years | 7432.00 | 260.43 | 3.50 | 238 | |
| Soap Suds | G. Friesland | Mature | 7192.30 | 251.78 | 3.50 | 300 | |
| Sixpence | G. Friesland | Mature | 8394.40 | 344.78 | 4.11 | 300 | |
| Sydney | G. Friesland | Mature | 7953.80 | 259.26 | 3.26 | 300 | |
| Cleo | G. Friesland | 2 years | 7606.00 | 289.13 | 3.80 | 300 | A. Berry, "Lendy," Marandellas. |
| Katie | G. Friesland | 2 years | 8193.00 | 275.39 | 3.36 | 300 | |
| Market | G. Friesland | Mature | 5645.00 | 236.93 | 4.20 | 252 | |
| D. 69 | G. Friesland | Mature | 7747.20 | 276.01 | 3.56 | 300 | A. L. Bickle, P.O. Box 595, Bulawayo. |
| Adelaide | G. Guernsey | Mature | 7886.70 | 326.14 | 4.14 | 300 | W. C. Boyce, "Omeath," P.O. M'sonneddi. |
| Bella | G. Guernsey | Mature | 5923.60 | 251.10 | 4.24 | 300 | |

**SEMI-OFFICIAL**—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Grove Park Helen | G. Shorthorn | Mature | 7836.00 | 268.55 | 3.43 | 300 | Bradley Bros., P.O. Box 699, Bulawayo. |
| Grove Park Polane | G. Friesland | Mature | 9171.00 | 285.31 | 3.11 | 300 | |
| Beauty | G. Friesland | Mature | 6069.00 | 253.99 | 4.19 | 300 | Miss N. Brereton, Coolmoreen, Gwelo. |
| Lulu | G. Friesland | 2 years | 8088.50 | 280.59 | 3.47 | 300 | B.S.A. Co. Mazoe Citrus Estate, Mazoe. |
| No. 18 | G. Friesland | Mature | 6449.00 | 232.65 | 3.61 | 278 | Col. P. A. Brooke, "Borrowdale-Homestead," P.O. Box 1690, Salisbury. |
| No. 84 | G. Friesland | 3 years | 6364.80 | 234.60 | 3.69 | 300 | Brucehame Dairy, Box 21, Fort Victoria. |
| Laurie | G. Friesland | Mature | 9387.00 | 324.50 | 3.46 | 300 | M. W. Burras, Box 443, Bulawayo. |
| Brenda | G. Ayrshire | Mature | 6284.50 | 225.13 | 3.58 | 300 | L. E. O. Cary, Clovelly, P.O. Trelawney. |
| Fresia | G. Ayrshire | Mature | 8636.00 | 326.03 | 3.77 | 300 | |
| Ruby | G. Ayrshire | Mature | 6193.50 | 230.76 | 3.73 | 286 | |
| Anne | G. Friesland | Mature | 9065.00 | 308.60 | 3.40 | 300 | Mrs. O. L. Christo, Box 110, Gwelo. |
| Spitfire | G. Friesland | Mature | 6910.00 | 243.32 | 3.52 | 274 | |
| Agnes | G. Friesland | 2 years | 9683.30 | 289.96 | 3.00 | 300 | Mrs. L. Jackson Clarke, Kingston Dairy, Gwelo. |
| Diana | G. Friesland | 2 years | 6326.80 | 251.39 | 3.97 | 182 | |
| Dolly | G. Friesland | 2 years | 8290.70 | 331.11 | 4.00 | 300 | |
| Midget | G. Friesland | Mature | 12606.00 | 439.02 | 3.48 | 300 | |
| Molly | G. Ayrshire | 2 years | 10609.50 | 404.52 | 3.81 | 300 | |
| Whiskey | G. Ayrshire | 4 years | 9763.50 | 353.88 | 3.62 | 300 | |
| No. 23 | G. Friesland | Mature | 8679.00 | 300.93 | 3.47 | 300 | Cross & Son, P.B. T.208, Bulawayo. |
| No. 120 | G. Friesland | 3 years | 6970.00 | 236.63 | 3.39 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ann | G. Friesland | 3 years | 7223.90 | 266.09 | 3.70 | 300 | J. V. Danckwerts, P.O. Box 989, Salisbury. |
| Audrey | G. Friesland | 2 years | 6671.70 | 269.79 | 4.04 | 300 | |
| Blantyre | G. Friesland | 4 years | 9934.60 | 341.30 | 3.44 | 273 | |
| Libby | G. Friesland | 2 years | 7159.40 | 251.80 | 3.50 | 300 | |
| Lorraine | G. Friesland | 2 years | 7755.50 | 265.98 | 3.43 | 300 | |
| Margot | G. Friesland | 4 years | 7492.60 | 279.32 | 3.73 | 300 | |
| Maureen | G. Friesland | 4 years | 6161.20 | 226.05 | 3.67 | 300 | |
| Munga Munga | G. Friesland | Mature | 9400.20 | 364.49 | 3.77 | 300 | |
| Jane | G. Friesland | 2 years | 6342.70 | 248.17 | 3.91 | 300 | |
| Sylvia | G. Friesland | 2 years | 7072.30 | 265.95 | 3.76 | 300 | |
| No. 22 | G. Guernsey | 3 years | 5402.00 | 247.04 | 4.57 | 300 | B. St. J. D. Downes, Safago Farm, P.B. Gwelo. |
| No. 333 | G. Guernsey | Mature | 8287.40 | 283.54 | 3.42 | 300 | |
| No. 387 | G. Guernsey | Mature | 7219.30 | 310.21 | 4.24 | 300 | |
| No. 455 | G. Guernsey | Mature | 6817.70 | 328.88 | 4.81 | 300 | |
| No. 457 | G. Guernsey | Mature | 7242.50 | 287.96 | 3.98 | 300 | |
| No. 469 | G. Guernsey | Mature | 7379.00 | 328.60 | 4.45 | 300 | |
| Sheelah | G. Friesland | 3 years | 6699.50 | 272.40 | 4.06 | 258 | Mrs. D. M. Edwards, Box 11, Eiffel Flats |
| No. 8 | G. Friesland | Mature | 6284.00 | 243.61 | 3.87 | 300 | |
| Queen Alexandra | G. Friesland | 4 years | 8977.00 | 344.00 | 3.83 | 300 | R. I. Edwards, Box 25, Chipinga. |
| No. 291 | G. Friesland | 3 years | 6986.00 | 254.93 | 3.69 | 275 | R. le S. Fischer, Wakefield, Headlands. |
| No. 51 | G. Friesland | Mature | 7547.00 | 292.78 | 3.88 | 300 | |
| No. 72 | G. Friesland | Mature | 8549.00 | 338.40 | 3.96 | 300 | |
| No. 88 | G. Friesland | Mature | 7539.00 | 289.89 | 3.85 | 300 | |
| No. 160 | G. Friesland | Mature | 7317.00 | 254.29 | 3.48 | 300 | |
| No. 283 | G. Friesland | 3 years | 6869.00 | 242.89 | 3.54 | 287 | |
| No. 5 | G. Friesland | 3 years | 10685.00 | 361.57 | 3.39 | 300 | Mrs. H. C. Fischer, Olivia Farm, Headlands. |
| No. 17 | G. Friesland | 3 years | 9693.00 | 309.62 | 3.19 | 300 | |
| No. 59 | G. Friesland | Mature | 11068.00 | 393.73 | 3.56 | 300 | |
| No. 130 | G. Friesland | Mature | 9657.00 | 372.77 | 3.86 | 300 | |
| No. 150 | G. Friesland | 4 years | 9343.50 | 345.01 | 3.69 | 300 | |
| No. 239 | G. Friesland | Mature | 8336.50 | 256.16 | 3.07 | 292 | |
| No. 32A | G. Friesland | 4 years | 7781.00 | 305.56 | 3.93 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 37A | G. Friesland | 4 years | 8206.00 | 268.66 | 3.27 | 300 | |
| No. 69A | G. Friesland | 3 years | 6596.00 | 250.98 | 3.81 | 300 | |
| No. 355 | G. Friesland | Mature | 7524.00 | 259.02 | 3.44 | 300 | |
| No. 412 | G. Friesland | Mature | 7125.00 | 293.50 | 4.12 | 300 | |
| No. 446 | G. Friesland | 4 years | 6010.00 | 233.51 | 3.89 | 300 | |
| No. 463 | G. Friesland | Mature | 6406.00 | 248.27 | 3.87 | 300 | |

## SEMI-OFFICIAL—(Continued)

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 475 | G. Friesland | Mature | 6196.00 | 278.15 | 4.49 | 286 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 561 | G. Friesland | Mature | 7235.00 | 258.42 | 3.57 | 300 | |
| No. 570 | G. Friesland | 4 years | 6150.00 | 259.23 | 4.21 | 300 | |
| No. 593 | G. Friesland | 4 years | 5789.00 | 250.45 | 4.32 | 300 | |
| No. 597 | G. Friesland | 4 years | 6717.00 | 247.16 | 3.68 | 300 | |
| Gilston Constance | P.B. Red Poll | Mature | 5991.00 | 228.59 | 3.81 | 300 | G. N. Fleming, Box 688, Salisbury. |
| Flower | G. Common | 2 years | 6078.00 | 240.28 | 3.95 | 300 | F. W. Forrester, Wilton. Marandellas. |
| Josephine | G. Guernsey | Mature | 8921.00 | 330.41 | 3.82 | 300 | |
| Pyjamas II | G. Friesland | 4 years | 6268.00 | 232.80 | 3.71 | 300 | |
| Gwenam | G. Friesland | Mature | 7156.90 | 243.60 | 3.40 | 300 | P. Freeland, Lingfield, Gwelo. |
| Julia | G. Friesland | Mature | 9357.10 | 326.79 | 3.49 | 300 | |
| Kanda | G. Friesland | Mature | 8186.50 | 286.77 | 3.51 | 300 | |
| Skokie | G. Friesland | 4 years | 6526.20 | 229.60 | 3.52 | 300 | |
| Vingia | G. Friesland | Mature | 8039.80 | 314.17 | 3.91 | 300 | |
| No. 2 | G. Friesland | Mature | 6797.20 | 235.24 | 3.46 | 300 | |
| No. 25 | G. Friesland | Mature | 6842.20 | 274.50 | 4.01 | 300 | |
| No. 28 | G. Friesland | 4 years | 7770.40 | 250.09 | 3.22 | 300 | |
| No. A.96 | G. Friesland | Mature | 7330.20 | 272.91 | 3.72 | 264 | |
| No. 6 | G. Friesland | Mature | 12432.50 | 398.74 | 3.21 | 300 | S. Gelman, 27, Baxendale Street, Bulawayo. |
| Flo | G. Aberdeen-Angus | Mature | 8048.00 | 345.51 | 4.29 | 296 | Hon. H. V. Gibbs, P.B. 52L, Bulawayo. |
| Hane | G. Friesland | Mature | 9639.00 | 347.50 | 3.61 | 300 | |
| Mary | G. Friesland | Mature | 9166.00 | 354.10 | 3.83 | 300 | |
| Poppy | G. Friesland | 4 years | 8938.00 | 336.91 | 3.77 | 300 | |
| Elsa | G. Friesland | 3 years | 5375.00 | 232.85 | 4.33 | 300 | Mrs. P. Gordon Lennox, "Rakodzi," Marandellas. |
| No. 113 | G. Friesland | Mature | 9590.50 | 307.93 | 3.21 | 271 | Government Farm, Gwebi, P.B. 76B, Salisbury. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Barlow's Vergelegen | | | | | | | |
| Jill | P.B. Jersey | 4 years | 5535.00 | 350.52 | 6.33 | 300 | Government Experimental Farm, Karoi. |
| Myrtle | G. Jersey | 3 years | 5201.50 | 264.03 | 5.07 | 300 | |
| No. 42 | G. Friesland | Mature | 16130.00 | 499.59 | 3.10 | 300 | Grasslands Experiment Stn., Marandellas |
| No. 57 | G. Friesland | Mature | 12005.00 | 453.90 | 3.78 | 300 | |
| No. 79 | G. Friesland | Mature | 9376.00 | 388.94 | 4.15 | 271 | |
| Pinafore | G. Friesland | 2 years | 5557.90 | 225.19 | 4.05 | 282 | E. E. C. Green, Mutzarara, Melsetter. |
| Fay | G. Guernsey | Mature | 5829.70 | 236.63 | 4.06 | 300 | D. A. Harley, Harleyton. P.O. Beatrice. P.O. Beatrice. |
| Lena | G. Friesland | Mature | 7067.70 | 252.19 | 3.56 | 300 | |
| Maud | G. Guernsey | Mature | 5891.60 | 258.66 | 4.39 | 300 | |
| Phyllis | G. Guernsey | Mature | 6696.30 | 245.05 | 3.66 | 300 | |
| Queenie II | G. Guernsey | Mature | 6171.20 | 242.90 | 3.94 | 300 | |
| Sarah | G. Guernsey | Mature | 7407.40 | 306.93 | 4.14 | 300 | |
| Valerie | G. Guernsey | Mature | 5349.00 | 238.88 | 4.47 | 286 | |
| Fidget | G. Friesland | Mature | 7161.00 | 246.69 | 3.44 | 300 | D. J. Huddy, Box 718, Salisbury. |
| Lulu | G. Friesland | Mature | 8719.50 | 287.23 | 3.29 | 300 | |
| Matilda | G. Friesland | Mature | 5955.00 | 249.37 | 4.19 | 227 | |
| Mattie | G. Friesland | Mature | 6866.00 | 254.14 | 3.70 | 279 | |
| Rosella | G. Friesland | Mature | 9280.50 | 305.60 | 3.29 | 254 | |
| No. 67 | G. Friesland | Mature | 6035.50 | 243.20 | 4.03 | 237 | |
| Manwere | G. Friesland | Mature | 6904.40 | 250.43 | 3.63 | 300 | L. Huddy, Box 924, Salisbury. |
| Rose | G. Guernsey | Mature | 10022.50 | 339.26 | 3.38 | 300 | |
| Brenda | G. Guernsey | Mature | 7473.00 | 278.46 | 3.73 | 297 | Mrs. M. R. Huddy, P.O. Box 899, Salisbury |
| Elsie | G. Guernsey | Mature | 5841.50 | 256.98 | 4.40 | 300 | |
| Gillia | G. Jersey | 3 years | 7395.00 | 373.82 | 5.04 | 296 | J. A. G. Hughes, Bains Hope, P.O. Melfort. |
| Reno | G. Friesland | Mature | 12112.00 | 407.78 | 3.36 | 300 | |
| J.25/1 | G. Friesland | Mature | 11988.00 | 384.80 | 3.21 | 300 | J. Jamieson, Box 217, Bulawayo. |
| No. 15A | G. Friesland | Mature | 8910.00 | 302.69 | 3.40 | 300 | D. S. Kabot, Box 261, Bulawayo. |
| No. 29A | G. Friesland | 4 years | 7908.00 | 273.26 | 3.46 | 232 | |
| No. 36 | G. Friesland | Mature | 11159.00 | 384.78 | 3.45 | 300 | |
| No. 37 | G. Friesland | Mature | 11276.00 | 367.57 | 3.26 | 300 | |
| No. 38A | G. Friesland | 3 years | 10300.00 | 441.43 | 4.29 | 300 | |
| No. 49 | G. Friesland | Mature | 7127.00 | 225.62 | 3.15 | 251 | |
| No. 59 | G. Friesland | Mature | 7921.00 | 287.25 | 3.63 | 242 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| K.19 | G. Friesland | Mature | 9973.70 | 331.95 | 3.33 | 300 | B. H. Kew, Box 972, Bulawayo. |
| K.32 | G. Friesland | Mature | 7609.90 | 295.02 | 3.88 | 300 | |
| K.35 | G. Friesland | Mature | 8937.30 | 337.09 | 3.77 | 300 | |
| K.50 | G. Friesland | 4 years | 9348.60 | 372.05 | 3.98 | 300 | |
| Jessie | G. Guernsey | 3 years | 5321.70 | 229.79 | 4.32 | 300 | J. A. G. Kirstein, P.O. Box 199, Gwelo. |
| Lucy | G. Guernsey | 3 years | 5360.80 | 248.66 | 4.64 | 300 | |
| Mof | G. Guernsey | 3 years | 5591.80 | 235.80 | 4.22 | 300 | |
| Bulawayo | G. Guernsey | 4 years | 5640.80 | 263.16 | 4.68 | 300 | |
| Susie | G. Guernsey | Mature | 5899.40 | 245.34 | 4.16 | 300 | |
| Nancy | G. Friesland | Mature | 6894.00 | 251.89 | 3.65 | 300 | J. N. L. MacIlwaine, Box 23, Marandellas. |
| Whinburn Balsam | P.B. Friesland | Mature | 6759.00 | 275.78 | 4.08 | 289 | |
| Howie's Dainty X | P.B. Ayrshire | 3 years | 7361.00 | 254.60 | 3.46 | 300 | J. MacIntyre, Box 58, Shamva. |
| Betty | G. Friesland | Mature | 7615.50 | 255.14 | 3.35 | 300 | D. W. Marshall, Alderbury, Box 164, Umtali. |
| Clover | G. Friesland | Mature | 7117.50 | 242.70 | 3.41 | 300 | |
| Lulu | G. Friesland | 4 years | 6806.90 | 227.14 | 3.34 | 286 | |
| Emma | G. Friesland | Mature | 6603.20 | 234.82 | 3.56 | 300 | A. R. Matches, P.O. Box 64, Salisbury. |
| George | G. Friesland | 2 years | 5810.60 | 230.94 | 3.97 | 300 | |
| May | G. Friesland | Mature | 9981.70 | 353.84 | 3.54 | 300 | |
| Paddy | G. Friesland | Mature | 6004.30 | 253.74 | 4.23 | 300 | |
| Minhinick Aurora | P.B. Friesland | 3 years | 7453.00 | 257.44 | 3.45 | 300 | J. U. McCay, P.B. J181, Bulawayo. |
| Thibet Park Martyn's Helene | P.B. Friesland | Mature | 8769.00 | 310.94 | 3.55 | 294 | |
| No. 118 | G. Friesland | Mature | 10438.00 | 318.06 | 3.05 | 300 | |
| No. 142 | G. Friesland | 4 years | 6721.00 | 232.87 | 3.46 | 300 | |
| No. 145 | G. Friesland | 4 years | 6215.00 | 237.37 | 3.82 | 300 | |
| No. 149 | G. Friesland | 4 years | 6271.00 | 242.95 | 3.87 | 300 | |
| No. 165 | G. Friesland | 3 years | 6858.00 | 233.36 | 3.40 | 300 | |
| Bluey | G. Friesland | Mature | 7098.30 | 254.76 | 3.59 | 284 | J. H. McLean, Box 161, Gwelo. |
| Betty | G. Friesland | Mature | 5473.60 | 245.36 | 4.48 | 296 | |
| Kirstein | G. Friesland | Mature | 7070.60 | 244.94 | 3.46 | 292 | |
| Moff | G. Friesland | Mature | 7437.20 | 251.92 | 3.39 | 268 | |
| Rhona | G. Shorthorn | Mature | 6516.20 | 269.31 | 4.13 | 288 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Baby | G. Friesland | Mature | 6548.50 | 289.67 | 4.42 | 300 | L. McLean, Divide, Gwelo. |
| Makorsi | G. Friesland | Mature | 5664.50 | 239.02 | 4.22 | 221 | |
| Rita | G. Friesland | Mature | 7696.50 | 244.21 | 3.17 | 300 | |
| No. 64 | G. Guernsey | 4 years | 7407.50 | 282.74 | 3.82 | 300 | |
| No. 68 | G. Friesland | 3 years | 8178.00 | 281.34 | 3.44 | 300 | |
| No. 4/9 | P.B. Friesland | Mature | 8322.00 | 254.21 | 3.05 | 300 | Meikles Trust & Invest. Co., Ltd., Leachdale Farm, Shangani. |
| No. G.12/3 | G. Friesland | Mature | 8220.00 | 272.39 | 3.31 | 300 | |
| G.16/3 | G. Friesland | Mature | 8731.00 | 298.81 | 3.40 | 300 | |
| Bessie | G. Ayrshire | 4 years | 7310.00 | 259.89 | 3.56 | 300 | R. L. Moffat, Ormiston, Shangani. |
| Dorothea | G. Ayrshire | 4 years | 6541.00 | 269.49 | 4.12 | 300 | |
| Eve | G. Ayrshire | 4 years | 7289.00 | 295.83 | 4.06 | 300 | |
| Gracie | G. Ayrshire | 4 years | 6647.00 | 266.39 | 4.01 | 300 | |
| Lassie | G. Ayrshire | 4 years | 6360.00 | 287.66 | 4.52 | 300 | |
| Ursula | G. Ayrshire | 4 years | 4315.00 | 238.87 | 5.54 | 300 | Com. E. L. Morant, Box 741, Salisbury. |
| Princess Marina | G. Friesland | Mature | 6474.00 | 269.22 | 4.16 | 266 | G. R. Morris, P.O. Box 1040, Salisbury. |
| No. 148 | G. Friesland | Mature | 6764.00 | 233.38 | 3.45 | 293 | F. B. Morrisby, Box 36, Gwelo. |
| Brakfontein Witkwas XIX | P.B. Friesland | Mature | 11129.00 | 401.38 | 3.61 | 300 | K. Norvall, Box 637, Bulawayo. |
| Dulcie II | G. Friesland | Mature | 6825.00 | 230.43 | 3.38 | 300 | |
| Minhinick Urchin | P.B. Friesland | 2 years | 9194.00 | 307.50 | 3.34 | 300 | |
| Una I | G. Friesland | 4 years | 7129.00 | 234.53 | 3.29 | 277 | |
| No. 11 | G. Friesland | Mature | 6098.00 | 225.06 | 3.69 | 268 | P. Odendaal, Whittington, Box 4, Chipinga. |
| No. 38 | G. Friesland | Mature | 9380.00 | 317.40 | 3.38 | 280 | |
| No. 78 | G. Friesland | 4 years | 8257.00 | 304.63 | 3.70 | 300 | |
| Helen | G. Friesland | Mature | 5956.40 | 244.73 | 4.11 | 300 | E. Palmer, Ferndale, Penhalonga. |
| Julia | G. Friesland | 3 years | 6880.10 | 246.23 | 3.58 | 238 | |
| Meg | G. Friesland | Mature | 6945.00 | 293.69 | 4.23 | 253 | |
| Patsy II | G. Friesland | 3 years | 7263.00 | 291.37 | 4.01 | 268 | |
| Brenda | G. Friesland | 2 years | 12638.50 | 402.07 | 3.18 | 300 | J. D. Parsons, P.O. Box 7, Bulawayo. |
| Butter Dish | G. Friesland | 3 years | 7340.10 | 244.20 | 3.33 | 300 | |
| Kimpton | G. Friesland | 3 years | 10850.00 | 342.29 | 3.15 | 300 | |
| Surprise | G. Friesland | Mature | 15393.00 | 511.31 | 3.32 | 300 | |
| Wicky | G. Friesland | 4 years | 10035.00 | 301.05 | 3.00 | 264 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 46 | G. Friesland | Mature | 6299.00 | 229.57 | 3.64 | 300 | T. C. Pascoe, P.O. Box 1253, Salisbury. |
| No. 118 | G. Friesland | Mature | 8489.00 | 296.48 | 3.49 | 300 | |
| No. 152 | G. Friesland | Mature | 6148.00 | 230.81 | 3.73 | 300 | |
| No. 178 A | G. Friesland | Mature | 5846.00 | 229.54 | 3.92 | 300 | |
| No. 248 | G. Friesland | Mature | 7457.00 | 239.65 | 3.21 | 300 | |
| Augusta | G. Friesland | 4 years | 8954.20 | 311.58 | 3.48 | 300 | Red Valley Estate, Lushington, Marandellas. |
| Bettapatsy | G. Friesland | 4 years | 9534.80 | 323.97 | 3.40 | 300 | |
| Last | G. Friesland | Mature | 7276.50 | 267.85 | 3.68 | 300 | Mrs. M. Rogers, Bickford, Gwelo. |
| Mollie | G. Friesland | 4 years | 8876.70 | 297.07 | 3.34 | 300 | W. F. H. Scutt, Maple Leaf, Norton. |
| Sophia | G. Friesland | Mature | 7884.70 | 262.76 | 3.33 | 283 | |
| Gubeni | G. Friesland | Mature | 6100.00 | 265.77 | 4.35 | 270 | L. F. Sheffield, Orange Park, P.O. Macheke. |
| Johannesburg | G. Friesland | Mature | 5716.50 | 229.19 | 4.01 | 300 | |
| Salome | G. Friesland | Mature | 6893.00 | 238.03 | 3.45 | 256 | |
| Effie | G. Jersey | 4 years | 6891.00 | 326.69 | 4.74 | 300 | W. Smith-Baillie, Finevara, P.B. 43, Marandellas. |
| Star | G. Jersey | 2 years | 5874.00 | 290.14 | 4.94 | 300 | F. Squires, P.O. Box 1052, Salisbury. |
| Battle Elsie V (P. 25) | P.B. Ayrshire | Mature | 7051.00 | 252.52 | 3.58 | 300 | J. R. Stewart & Sons, Ltd., Battle Farm, P.O. Shangani. |
| Battle Fairy IV | P.B. Ayrshire | Mature | 6732.00 | 246.05 | 3.67 | 282 | |
| G. 2A | G. Ayrshire | Mature | 6369.00 | 246.62 | 3.87 | 271 | |
| G. 21A | G. Ayrshire | Mature | 6422.00 | 231.46 | 3.60 | 300 | |
| G. 22 | G. Ayrshire | Mature | 6828.00 | 279.13 | 4.08 | 267 | |
| Beauty II | G. Friesland | 4 years | 8656.00 | 386.93 | 4.47 | 300 | E. Tapson Trust, Ltd., Lesapi Falls, Rusape. |
| Chineya | G. Friesland | Mature | 7191.00 | 260.68 | 3.63 | 300 | |
| Umtali | G. Friesland | Mature | 8573.00 | 340.07 | 3.97 | 281 | |
| Sunshine | G. Friesland | 3 years | 7029.00 | 289.28 | 4.10 | 300 | |
| Tank | G. Friesland | Mature | 8119.00 | 320.04 | 3.94 | 263 | |
| Bolongna | G. Friesland | 3 years | 7847.00 | 317.50 | 4.05 | 300 | |
| Butterfly II | G. Friesland | 3 years | 7264.00 | 284.43 | 3.92 | 300 | |
| Escombe | G. Friesland | 3 years | 6921.00 | 266.53 | 3.85 | 300 | |
| Framassina | G. Friesland | Mature | 7555.00 | 281.70 | 3.73 | 255 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| July | G. Friesland | Mature | 7859.00 | 273.41 | 3.48 | 280 | Evelyn Tapson Trust, Ltd., "Lesape Falls," Rusape. |
| Marina | G. Friesland | 3 years | 7360.00 | 294.41 | 4.00 | 300 | |
| Matope | G. Friesland | 3 years | 8302.00 | 310.85 | 3.74 | 300 | |
| Poy Poy | G. Friesland | 2 years | 8582.00 | 323.52 | 3.77 | 300 | |
| Queen II | G. Friesland | 3 years | 7690.00 | 322.35 | 4.19 | 300 | |
| Somabula II | G. Friesland | 2 years | 8449.00 | 295.57 | 3.50 | 300 | |
| Charlie | G. Friesland | Mature | 7191.90 | 259.49 | 3.61 | 286 | L. Taylor. Box 55, Selukwe. |
| Chibi | G. Friesland | Mature | 9521.40 | 306.87 | 3.22 | 300 | |
| Gwelo | G. Friesland | Mature | 9009.00 | 310.95 | 3.45 | 300 | |
| Molly | G. Friesland | 4 years | 5708.20 | 234.34 | 4.11 | 281 | |
| Nyembesi | G. Friesland | 4 years | 8802.70 | 354.54 | 4.03 | 300 | |
| Boy | G. Friesland | Mature | 7405.00 | 260.65 | 3.52 | 265 | A. W. Tennent, Kelvin, Headlands. |
| Mary | G. Friesland | Mature | 7164.40 | 234.90 | 3.28 | 274 | |
| Rosie | G. Friesland | Mature | 8423.50 | 311.42 | 3.70 | 300 | |
| No. 13 | G. Friesland | Mature | 6537.20 | 232.51 | 3.56 | 261 | |
| No. 23 | G. Friesland | Mature | 6808.90 | 253.17 | 3.72 | 252 | |
| No. 25 | G. Friesland | 4 years | 7486.80 | 278.61 | 3.72 | 275 | |
| No. 36 | G. Friesland | 4 years | 7259.30 | 257.29 | 3.55 | 278 | |
| No. 47 | G. Friesland | 3 years | 7881.50 | 302.71 | 3.84 | 300 | |
| No. 49 | G. Friesland | 2 years | 6148.70 | 228.44 | 3.72 | 300 | |
| No. 52 | G. Friesland | 3 years | 7956.80 | 292.95 | 3.68 | 300 | |
| No. 53 | G. Friesland | 3 years | 7377.80 | 284.58 | 3.86 | 300 | |
| No. 59 | G. Friesland | 3 years | 7552.40 | 272.82 | 3.61 | 288 | |
| No. 83 | G. Friesland | 2 years | 6005.30 | 231.83 | 3.86 | 282 | |
| No. 84 | G. Friesland | 3 years | 6864.00 | 249.50 | 3.64 | 291 | |
| Nurse IV | G. Friesland | 3 years | 6809.00 | 295.41 | 4.34 | 300 | P. S. Timms, Chitora, Rusape. |
| No. 3 | G. Friesland | 3 years | 5891.00 | 233.74 | 3.97 | 300 | |
| Sybil | G. Friesland | Mature | 7183.80 | 230.51 | 3.20 | 300 | Martin Tracey, Tawstock, Chakari, P.B. 21, Gatooma. |
| Tiny | G. Friesland | 4 years | 9035.00 | 282.89 | 3.13 | 300 | Mrs. M. Turnbull, P.O. Box 479, Bulawayo. |
| Elysoun II | G. Friesland | Mature | 10599.00 | 320.89 | 3.03 | 300 | R. O. Waldschutz, Box 27, Marandellas. |
| Grace | G. Friesland | Mature | 6843.00 | 241.80 | 3.53 | 300 | |
| Heather | G. Friesland | Mature | 6061.00 | 235.35 | 3.88 | 300 | |
| Susan I | G. Friesland | Mature | 6910.00 | 244.05 | 3.53 | 300 | |

"Fawkham Daydream II's lactation record was incorrectly published under Official Milk Records in the May/June issue, and should have appeared under Semi-official Milk Records as under:—

"Fawkham Daydream II—P.B. Jersey—2 year old. Milk, lbs.,6120.70; Butterfat, lbs., 251.56; Average per cent. butterfat, lbs., 4.11; No. of Days, 283. Owner: W. Smith-Baillie, P.B. 43, Marandellas."

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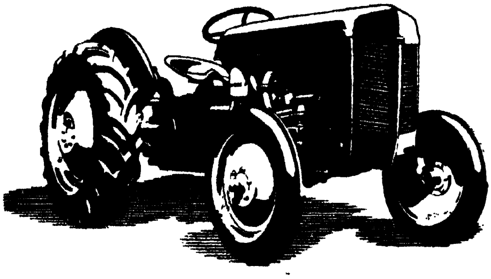

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**Gatooma - Marandellas**
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THE RHODESIA
Agricultural Journal

Vol. XLVII. No. 6 November-December, 1950

# Editorial

## Notes and Comments

### RAMIE (*Boehmeria nivea*).

A brief summary of information on the agricultural aspects of fibre production from *Boehmeria nivea* has been received from R. R. W. Sievers, of White Waters Estates (Pty.), Ltd., Pretoria.

Ramie belongs to the nettle family (*Urticaceae*), and is grown commercially for its bast fibres, which have a very great tensile strength, as can be seen from the following table.

| | Ramie | Hemp | Flax | Silk | Cotton |
|---|---|---|---|---|---|
| Tensile Strength | 100 | 36 | 25 | 13 | 12 |
| Elasticity ...... ...... | 100 | 75 | 66 | 400 | 100 |
| Torsion ...... ...... ...... | 100 | 95 | 80 | 600 | 400 |

To get the best results Ramie should be grown on fertile soil with a pH value of between five and six and on soil which has a high percentage of N. Good moisture and good drainage are also essential. Unless it is possible to irrigate the crop then it should be grown in the higher rainfall areas.

The crop is a perennial and requires planting only once in five to eight years. The land should be well chosen and well prepared before planting. Ramie is generally propagated by root cuttings (rhizomes) or from selected seed. The rhizomes are cut into pieces four inches to six inches long; this should be done in the shade. The pieces are planted three feet apart with an average of three feet between the rows. The rhizomes are dropped lengthwise into the furrows and covered with soil immediately. The planting depth is two inches to four inches. The soil should be damp but not wet for planting. Where no frost occurs and irrigation is available, Ramie may be planted any time. In the Union of South Africa it does best when planted in early spring so that the young plants are well established before the dry or cool season begins.

Usually it is sufficient to weed it for the first year after planting or until the spaces between the rows are fully covered—generally three to four hoeings are needed. Buds appear seven to ten days after planting and care should be taken to keep farm animals, especially fowls and pigs, out of the fields. About four months after planting stalks vary from one to three feet and appear rather stunted. These are cut down and left on the field for humus. The same thing happens with the second cut eight months after planting. With the third cut the stalks should have reached their maximum height—six to seven feet, and this will be the first harvest, generally about 60 to 75 days after planting. Harvesting time is indicated by the browning from the base of the stem up to a height of 2 inches to four inches. It is not advisable to delay harvesting until a larger percentage of stalk reaches the proper height as lignin develops if the plants are left after this time and the market value decreases. Usually three harvests are obtained per year and plantations reach maximum production in about three years.

In small plantations sickles or an ordinary mowing machine are used, while on big plantations special binder-type machines which mow and tie the stalks into bundles are used. The latest machines cut, defoliate and decorticate the stalks in one continuous operation while moving through the field.

The grower is only concerned with the yield of raw fibre and forage. The raw fibre has still to be degummed, and this is generally done by the spinning mill. Well degummed Ramie fibre is soft, pure white, and has a lustre like silk.

The following average yield on three cuts per year can be expected:—

| | | |
|---|---|---|
| Total green material harvested...... ...... ...... ...... ...... ...... | 24-28 | tons p. acre |
| Leaves and tops (forage), green ...... ...... ...... ...... ...... | 12-14 | ,, ,, ,, |
| Stalks, green weight ...... ...... ...... ...... ...... ...... ...... ...... ...... | 12-14 | ,, ,, ,, |
| Raw fibre, air-dry basis, machine decorticated | 0.5-0.6 | ,, ,, ,, |

A Ramie crop takes a lot out of the soil, therefore fertiliser requirements will be heavy.

The report ends with a discussion on the processing of the fibre and prices to be expected.

Quotations received from locally produced Ramie fibre ranged from £130 to £161 per ton c.i.f.; therefore it seems safe to assume the price will stabilise itself between £130 and £140 per ton, depending on quality. It must be clearly stressed, however, that the crop needs abundant water and it is very heavy on fertilisers.

Two Views of the Nest of the Angola Rock Thrush.

# Angola Rock Thrush

*Colonocincla angolensis niassea.*

By Capt. G. L. JAMES.

The Angola Rock Thrush is distributed from Angola across to Portuguese East Africa extending south to Mashonaland. There are few records of this rare and beautiful bird having been collected or seen over this large area. This may be partially due to shyness and a dislike of being molested. The nest and nesting habits are practically unknown.

The finding of a nest, near Salisbury, in *Brachystegia* woodland, on the 17th September, 1950, was an occasion of high expectation to obtain details of the birds' family life.

The nest was placed in a cleft in a tree (*Lannea discolor* Engl.) some five feet from the ground and contained three unmarked greenish-blue eggs (measurements: 2, 25 x 17.5; 1, 25 x 18 mm.) As will be seen from the photographs the nest greatly resembles that of a Black Flycatcher even to the material used—bents and tendrils lined with rootlets. The interior was shallow.

The female displayed extreme shyness leaving the nest when an intruder was some 60 yards away, and remained concealed in the foliage of a nearby tree. The male showed considerable courage in defence of his establishment, approaching within 10 yards and perching low down on a branch from which it captures insects on the ground, often, but not always, returning to the same perch with its prey.

The nest was again visited on the 24th in company with Mr. R. A. Jubb, who was able to confirm identification of both the nest and the bird. As on the previous occasion the hen left the nest when we were some distance away and remained concealed until 20 minutes after we had left the site and hidden behind trees.

Hopes of obtaining valuable information died on this visit when the nest tree was found to have a piece of "tembo" fastened round it, from which two nooses hung over the entrance to the nest. The trap was removed.

This is an excellent example of the difficulty of protecting wild life from the native. What could we do? Camp nearby and maintain a constant watch on the site? Not being in a position to do this, it is not surprising that on our next visit on the 24th, the nest was found empty and deserted. Moreover, the woods were searched then and on subsequent occasions, but no trace could be found of the birds, who appeared to have deserted the area.

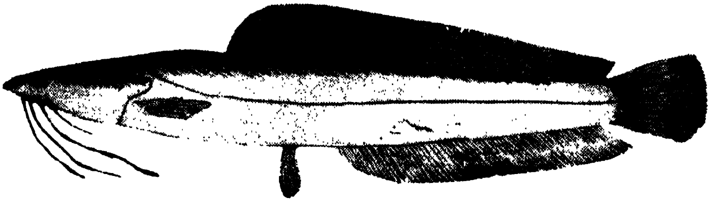
The name of this species is a misnomer, as they are not necessarily confined to rocky country, but from records available appear to prefer woodlands.

These birds are, as reported by Marshall in 1900, who obtained a specimen near Salisbury, insectivorous, the stomach of one he shot contained small *Coleoptera* (beetles), grasshoppers and black ants.

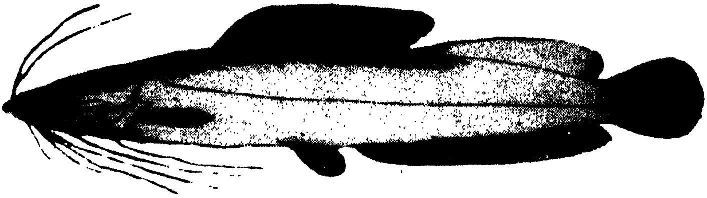
The male has the entire head, all round the neck and the back, slate-blue, appearing much lighter in strong sunlight; the crown is slightly mottled with black. Wings, dove-grey marginated with black; the upper and lower tail coverts are rufus barred with black, while the breast is chestnut paling to white on the abdomen.

The female is similar, but the head is mottled black on white and the breast is much paler than that of the male. The eyes are brown; bill and legs blackish in both sexes.

Two large "Vundu," Zambesi Valley.



Common Barbel (*Clarias* sp.)



Vundu (*Heterobranchus longifilis*).

# Some Notes on Freshwater Fishes in Southern Rhodesia

## PART VI.

By R. A. JUBB, B.Sc.

There are a considerable number of species of freshwater fish which are described as "naked"; this means that they have no scales on their bodies. Another characteristic is that they have long sensory organs or barbels on the lips and chin. Collectively these fish are known as "cat-fish," but, in South Africa certain species are more commonly known as "barbel." Scientifically the cat-fish common to our rivers are represented by two main families—the family *Clariidae* and the family *Bagridae.*

To the family *Clariidae* belong the slimy, bewhiskered cat-fish known as barbel, easily recognised by the long barbels, the flat bony head, and the long dorsal and ventral fins. These fish are widely distributed and are found in all rivers and impounded waters. They all have a special air-chamber above the gill which acts as a kind of lung and enables the fish to remain out of water for many hours and to exist in mud for many months. It has been reported that these fish take advantage of heavy dew or wet ground to travel short distances overland; this may account for the mysterious manner in which they have populated most of our dams.

All barbel are predators and play a most important part as scavengers in large rivers and lakes, but in the shelter of small streams and dams they themselves are protected from predators and they are a dead loss to farmers who want to stock their dams. Barbel prey on the young fish and interfere with the nests. In unrestricted waters they are reputed to grow to a length of over five feet and weight up to 100 lbs. In dams they appear to breed rapidly and become a serious problem.

Barbel are preyed upon by other fish such as tiger-fish and eels and by crocodiles, otters and the magnificent fish-eagle. The more popular fishing resorts are entirely free of these animals, and it is quite easy to understand why the barbel has become such a menace by virtue of its numbers which even organised barbel competitions cannot keep down. The eradication from or control of this fish in impounded waters is a problem which cannot be easily answered at present, certainly netting is not satisfactory as the fish sounds and gets well away in the mud. As a temporary measure baited night lines can be used with large hooks and liver of ox heart as bait. Barbel tend to come into the shallows at night, and an experienced African trapper can usually produce some good results with a fish trap of chicken netting.

Most Africans eat barbel and need no encouragement to assist in getting rid of the fish. To the European eating of barbel flesh is an acquired taste, probably depending to a great extent on the water from which the fish was removed. You cannot compare the taste of a well-cooked barbel taken from the Zambesi River, for instance, with that of the same species taken from the Makabusi! Where dried fish is an important African industry, as along the Zambesi River and the shores of Lake Nyasa, barbel are eagerly sought after for the fat and oil which is obtained by rendering down and used for curing of other fish. The slimy barbel has its uses—but not in a dam for fish-farming purposes.

Belonging to the same clan we have the family *Bagridae*, which includes some of the more athletic types of cat-fish, the species range from heavy-weights to those which do not exceed six inches in length. Species of this family are distinguished from those of the previous family by the rounder body and the adipose dorsal fin in addition to a much shorter dorsal fin than the barbel has.

The "Vundu," *Heterobranchus longifilis*, common to the Zambesi and its larger tributaries, is well known as a heavy-weight, and specimens of 60 to 80 lbs. have often been caught on a variety of baits using heavy tackle. This fish sticks to the deep pools and does not appear to come very far into the smaller rivers. The difference between the barbel and the vundu is shown in the sketch of two typical species. As far as is known, the vundu does not make its way into dams and is therefore not considered as vermin; on the contrary, it is an excellent fighter on occasions and provides a good meal for the camp boys.

None of the species of cat-fish is in any way of use for breeding for food purposes, and prospective fish farmers should consult the Fisheries Officer before stocking a dam with fingerlings of *Tilapia* or Black Bass and avoid the possibility of feeding a lot of barbel which have got themselves well established—first.

Young peach trees with galls on crown and roots.

# Crown Gall

## A WARNING TO GARDENERS AND GROWERS OF DECIDUOUS FRUIT.

By JANE BROADFOOT, B.Sc.,
Branch of Botany and Plant Pathology.

A number of cases has occurred recently where young deciduous fruit trees and roses have been found infected with Crown Gall, a bacterial disease which gives rise to lumps of tissue at the crown of the plant, either just below or just above ground level. Sometimes these galls are formed on roots, branches or at graft unions. The disease can be serious on young plants, but on old trees usually does not do much damage unless the actual crown is attacked, when death may take place after trees come into full bearing. It is a most undesirable disease to introduce into new orchards.

The bacteria from the galls can live in the soil for a number of years, infecting healthy trees which may be planted in it. No guaranteed method is known of freeing such soil from them.

The disease is common in Union nurseries and is also known to occur in some Rhodesian nurseries. The Union authorities make every effort to prevent nurserymen by regulation from sending out diseased trees, but it is believed that some nurserymen are still supplying diseased stock.

It is almost certain that in some cases mentioned above the disease was present on the plants when they were received for planting, so that growers of deciduous fruit trees, raspberries or roses on a large scale, are strongly advised to obtain their stocks from reliable nurseries only.

All plants should be examined on arrival, and if any galls are found, the suppliers and the Branch of Botany and Plant Pathology, P.O. Box 25, Causeway, Salisbury, should be informed. The galls are easily seen if all soil is removed. Unfortunately the absence of galls does not mean that the trees are free from infection, and for this reason great care is necessary in the selection of the supplier.

Soaking the roots for two hours in copper sulphate (7 oz. to 20 gallons water), therefore, is advised as a precaution and may reduce the chances of infection considerably.

Growers who want more information on this disease and its prevention should write to the Chief Botanist and Plant Pathologist, Box 25, Causeway, Salisbury.

# Beetroot and Boron Deficiency

By C. N. HAYTER, Horticulturist.

For some time it has been noticed that all is far from well with the growing of beetroot (*Beta vulgaris*) in Southern Rhodesia. Even in soils where fairly high fertility has been built up and good crops obtained with other kinds of vegetables, beetroot in some instances have been almost complete failures and some market gardeners have almost given up growing the crop.

## General Symptoms.

The first signs of trouble are usually noticed when the seedlings are about six weeks old, when their leaves begin to turn pale yellowish-green, losing their rich reddish-green colour and succulence. Growth tends to be much slower and the leaves eventually become much smaller than normal and are quite narrow.

The older leaves die early, and the new ones which replace them are distorted and have very short stems. In extreme cases these new leaves form rosette-like arrangements and are quite stunted.

## Root Appearance.

The beetroot themselves exhibit large black sunken patches or cankers on the outside, particularly at the widest part of the swollen root—as shown in the accompanying photographs—while cracks may also appear.

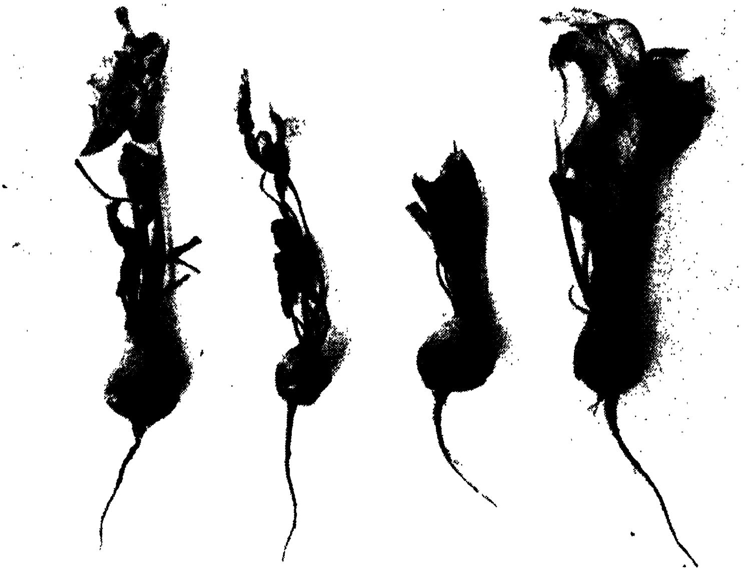
When this disease occurs seriously in infertile soils, growth is very slow and roots about a third to half the normal size are produced. These beetroots are very unattractive and exhibit an aged appearance. When cooked, they require approximately double the normal time to get them sufficiently soft to eat, but never become really well cooked.

From observations made of beetroot, grown and supplied to markets in the Salisbury area, it would appear that at least half the growers are experiencing this trouble in some of their types of soil. It is also prevalent in other parts of the Colony, including Melsetter.

## Deficiency Disease.

Having taken over a garden at Highlands some two years ago, the writer was faced with this beetroot trouble to quite a serious extent. The soil in question was a clayey vlei loam.

It was noted from work carried out overseas that boron plays a very important part in the growth of beetroot. Usually a deficiency of this minor element causes an internal breakdown, but it was also found that it can cause external blackened areas as described, without having the internal symptoms.



Effects of Severe Boron Deficiency, showing Arrested Growth, Deformed Foliage and Roots. (Photo. approximately one-third normal size.)

[Photo. by Public Relations.

Boron Deficiency Cankers on Normal Sized Beetroots.

[Photo. by Public Relations.

From this information, therefore, it was decided to try out boron applications and all sowings of beetroot seed were given a dressing of boric acid powder. This was applied immediately after the seed drills were filled in with soil at the rate of ¾-ounce per 100 feet length of row and over the row itself. A portion of each seed sowing was left untreated as a comparison control. In all, ten seedbeds were treated and the effect was most striking. Wherever boric acid powder had been applied, the beetroot was quite normal and healthy with a complete absence of blackening and cankers. The untreated portions of seedbeds showed all the deficiency troubles as previously.

### Further Trials.

Following this experiment, boric acid powder was applied to seedlings in other beds. It was found that this treatment was equally successful provided it was given before the plants were three weeks old. It should be pointed out that grown in fertile soil, adequately supplied with water, beetroots grown in summer are fit for pulling eight to ten weeks from the date of sowing, when they should be 2½ inches to 3 inches in diameter.

Borax was then given to different beds at 1⅓-ounces per 100 feet row length with the same good effect, but better crop results were obtained in all instances where 1/5th ounce per square yard (approximately 60 lbs. per acre) of borax or 40 lbs. of boric acid powder per acre was broadcast dry over the whole area and then watered in.

### Soil Tests.

Unfortunately, it was not possible at the time of the experiments to ascertain the pH values of the soil, but it was later found that where the beet had been grown the pH values varied between 6.5 and 7.5.

It is generally understood that as the acidity of the soil decreases and the alkalinity increases, so the minor elements become almost unavailable as plant food. For this reason it is most important not to apply lime or wood-ash to soils until soil tests have been carried out and recommendations made.

Boron deficiency is rather less pronounced where adequate water supplies are available, as the plants are then able to produce a much greater root system enabling them to obtain their food supplies from a larger soil area.

### Excess Boron.

The writer followed up the treatment of boron application with other horticultural crops in adjoining plots of the same soil type where previously turnips, rhubarb and cauliflower only grew very poorly.

Numerous replications were carried out and the usual controls left as comparisons. In every instance where boron had been applied, the effects were most striking and healthy crops were obtained.

It had also been noticed that cauliflowers refused to form white curds; instead yellow centres were produced which were completely unsuitable for food. The first applications of boron lightly applied to the seed-beds caused no marked improvement and larger amounts of boron up to an equivalent rate of 80 lbs. per acre of agricultural borax were applied to two outside rows of cauliflowers two weeks after being transplanted to their cropping position, while a centre row was left untreated.

This rate of application proved too heavy and toxicity was readily shown some three weeks later, although small white curds were finally produced.

After the cauliflower crop, the soil was given a light dressing of garden compost plus 1½ ounces per square yard of N.P.K. vegetable fertiliser and sown to beetroot.

The plants came away excellently and gave a perfect beet crop, one of the best the writer has grown. The usual control plot was very poor and stunted. Potatoes following the beetroot cropped well without any toxic symptoms; similar results were obtained from a following bean crop. After a six months' fallow, a small portion of the same ground has again been sown with beet to test for the residual boron effect.

### Second Borax Treatment.

Recent American research suggests that a second borax treatment is generally not necessary until a further two or three years, or until deficiency symptoms or analyses indicate such a need.

With continual cropping, especially under irrigation, boron may also become leached out. In the writer's soil it was noticed that rhubarb again showed deficiency symptoms six months after the first application.

### Boron No Cure-All.

Attention should be given to the fact that applications of boron are by no means a cure for all vegetable ills. Carelessly applied, much harm can be done to soils, making them toxic to many crops and necessitating treatment to restore them to fertility again.

Boron is a chemical element, but as it is not available in the pure state, borax or boric acid are used.

Borax contains 11.34 per cent. boron while boric acid contains 17.49 per cent. boron.

## *SUMMARY*

1. Beetroot is a difficult crop to grow in Southern Rhodesia particularly in soils with a pH value of 6.5 to 7.5 Many roots exhibit large black cankers and arrested growth.

2. Applications of boric acid powder at ½ ounce per 100 feet of row were tried out on seed beds, with a portion of each bed untreated. In every instance the treated portions gave perfectly healthy beetroot. Further trials were carried out on seedlings with equally good results provided the applications were given before the plants were three weeks old.

3. Borax was then tried on different beds at 1⅓ oz. per 100 ft. of row and also broadcasted at 1/5th oz. per square yard. The latter method gave the best results.

4. These results indicate that when it is difficult to grow beetroot even where normal cultural operations are carried out, the cause may be due to boron deficiency. Toxicity may result to following crops if the boron is carelessly applied.

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# Native Labour in Agriculture

(This report by Mr. V. W. Wadsworth summarises the results of the second part of a survey of labour use and mechanisation in agriculture. It deals with the maize farming group and should be read in conjunction with an introductory section and a report on labour on tobacco farms, which appeard in the May-June, 1950, issue of the "Rhodesian Agricultural Journal." These explained the assumptions on which the enquiry has been based. The field work for this report was carried out by Mr. J. D. Hopley, of the Economics Branch.)

## SECTION VII.

### GENERAL ASPECTS OF LABOUR ON MAIZE FARMS.

**Crops.**—The records used for this part of the enquiry were obtained from farms located in all the principal maize-growing areas of the Colony, and all the farms in the group obtained at least 50 per cent of their total cash income from direct sales of maize. The farms varied in size from 500 acres to 22,000 acres, with an average for the group of about 2,900 acres, as compared with the average for the tobacco group of 4,600 acres. But although the average maize farm was much smaller than the average tobacco farm, the older development of the maize areas and the lower profitability of this type of farming as compared with tobacco, were reflected in the greater acreage of arable. These farms showed an average of 631 acres under cultivation as compared with only 268 acres in the tobacco group. Maize was clearly preponderant in all cases. Two farmers grew no other crop whatsoever, and 17 others grew only a green crop in addition to maize. The remaining 61 grew small acreages of various other crops. Thus 12 growers had amongst them 348 acres of cotton; a further 23 had a total of 776 acres of tobacco; 10 of them grew in all 68 acres of potatoes; and 37 cultivated a total of 808 acres of groundnuts. The average summer cropping of the 80 farms studied was:—

| | |
|---|---|
| Maize (for grain) | 345 acres. |
| Maize (for silage) | 8 ,, |
| Green Manure | 181 ,, |
| Legume Hay | 36 ,, |
| Groundnuts | 12 ,, |
| Tobacco | 10 ,, |
| Cotton | 5 ,, |
| Other Crops | 34 ,, |
| | 631 acres. |

With 56 per cent. of the total arable acreage devoted to maize production, the heavy dependence of the group on this crop is most marked. Indeed, if maize were not the subject of price and market guarantees, the relatively small cultivation of other cash crops (9 per cent.) so far practised would not make for economic stability. As it is it does not permit of maximum efficiency in labour utilisation.

Of the farms studied, only three had under 100 acres of maize; 11 fell into the 100-200 acre group; 16 produced maize on from 200-300 acres; 37 grew from 300-400 acres; and 13 cultivated over 400 acres. Two principal rotations are current, on the poorer or more exhausted soils maize generally follows green crops in alternate years. Elsewhere this rotation has been extended to maize, maize, and greencrop, with side-crops filling in as convenient and on smaller acreages. Where tobacco was grown this was usually produced on land cleared and broken up specifically for the purpose, and not on the ordinary arable lands.

**Livestock.**—Stocking on these farms was numerically about the same as on those in the tobacco group, though obviously more intensive, owing to the smaller size of the farms. Over the whole sample, the average stocking was as follows:—

| | | |
|---|---|---|
| Dairy Stock | | 11 |
| Beef Stock: | Cows | 65 |
| | Followers | 55 |
| | Other | 36 |
| Fat Stock | | 7 |
| Work Oxen | | 48 |
| Equines | | 2 |
| Sheep | | 48 |
| Goats | | 3 |
| Pigs | | 35 |
| Poultry | | 117 |

This is the equivalent of 179 stock units per farm, as against 178 stock units on the far larger tobacco holdings. Indeed, the greater relative emphasis on livestock goes far to redress the unbalance of the farming system so far as the arable is concerned. The group included 18 small dairy herds, mostly producing cream, 22 pig producers, and 9 beef fatteners. All these activities are useful corollaries to maize production, both from a mixed farming and a labour-spread point of view. None of these enterprises figured significantly in the tobacco group.

**Labour Force.**—To maintain the stock shown above, these farmers kept an average of eight natives. This represents one native for every 25 stock units as opposed to one for 35 in the tobacco sample. The difference is readilly accounted for by the type of stock kept, dairy cows and pigs both having a relatively heavy stock requirement.

As compared with 73 boys per farm or 3.6 acres per boy employed on crops in the tobacco group, the average in the maize group was 35 boys per farm or 18 acres of crop per boy employed. All the above figures are shown in boy-equivalents. In actual practice there was an average of 40 boys and 6 picannins regularly employed on all types of work—the equivalent of [illegible] boys. In addition 14 women and picannins were employed per farm on a casual basis. These represented eight male adult equivalents or one casual labourer to every 78 acres of crop. In contrast with the employment of one casual for every 13 acres of crop on the tobacco farms, the lower dependence on a floating force is most marked.

**The Source of Regular Labour.**—It has been recorded in the case of tobacco farms that there is an alarming dependence on alien natives for the maintenance of the farm labour supply. The position is even more serious on maize farms, 28 per cent. only of the total labour force on the farms examined having been recruited from local sources, 72 per cent. of the total natives employed came from outside the territory. Five of the farmers visited had no indigenous labour whatsoever.

The labour force on these farms, however, had been much more stable than that on the tobacco farms. Whereas on the latter only 17 per cent. had been with the farmer more than three seasons, on the maize farms the corresponding figure was 37 per cent. A further 53 per cent. was in the second or third season, and only 10 per cent. was new. This factor has two distinct aspects. In the first place it probably reflects the fact that 44 per cent. of the total adult males had their wives and families with them, as against only 18 per cent. in the tobacco group. It was borne out that the farmers with the most stable labour forces were those carrying the highest percentage of men with resident families. The desirability of a stable labour force from the point of view of efficiency calls for no further comment. In the second place the position is extremely disturbing in that it reflects the serious decrease in the recruitment of new labour to this group of farms.

**Type of Work Performed.**—As was the case on the tobacco farms, 90 per cent. of the labour on maize farms was described as general. But again we found men employed according to acquired specialist aptitude and in a few cases there was evidence of actual and painstaking training in work with livestock. It is still clear, however, that far too much reliance is being placed on the native as a gang worker. His skill, such as it is, is usually either inherent, or acquired without any methodical instruction. He is hardly ever regarded as other than an untrained and unintelligent labourer, or as capable of anything better.

**Casual Labour.**—All except nine farms employed casual labour. In one case the source of supply was the local jail, two farms drew their supplies from neighbouring Reserves, and the remainder had a supply of women and children from their own compounds. An average of 14 persons was employed as casuals. Employment of casual labour varied from one to six months in the year with an average of two months. The type of work in which this casual labour was employed varied considerably. In a number of cases it was stated to be employed solely in connection with "side" crops, whilst in others it was employed wholly on tobacco work.

Generally casual labour is switched where the need is most pressing, and in this group work included picking cotton, reaping beans, reaping and bagging groundnuts, planting, cleaning, and reaping maize.

**Hours of Work.**—The general opinion was confirmed that the hours of work on maize farms are substantially longer than on tobacco farms. On six farms six hours was the general rule. Fourteen farmers reckoned on seven hours, and 26 on eight hours. Ten farms had a nine hour day and 24 worked ten hours or longer. Moreover there is no question here of seasonality. These hours are worked six days a week, 50 weeks in the year. As in the case of the tobacco group, however, the figures shown above can be reduced by at least one hour per day to cover meal breaks and to arrive at actual working time.

**Wages.**—Wages were in all cases paid both in cash on a monthly basis and in kind.

The average cash wage paid to boss boys was £3, about the same as on tobacco farms. This, however, was a fairly steady figure whereas on the tobacco farms we came across payments of £5. The only other differential payment was made to tractor drivers, for whom the wage rate has varied at between £2 and £3, with an average of 50s. For general labourers the highest cash wage recorded was 45s. (an isolated case). The general rate was found to be 32s. 6d., with about 25 per cent of the farmers paying 35s. There was less differential payment than on tobacco farms, but apart from this factor the general wage level was much the same, though, as has been noted, the rate per hour was lower due to the longer hours worked.

Far more variation was found in the conditions under which casual labour was employed. 30 per cent. paid women 1s. per day and picannins 6d. per day plus food. A further 2 per cent. paid 1s. 6d. per day and no food, whilst another 10 per cent. paid only 9d. per day plus full rations. The remainder paid their casual labour on a piece-work basis. Typical harvesting rates of frequent occurrence were 1s. per bag groundnuts, 3d. per 10 lbs. seed cotton, 4d. per bag beans, 2d. per bag mealies.

On every farm visited, regular labour was paid on a combined ticket and piece-work basis. The normal ticket is 30 days with a weekly pay-out on completed tickets. In 41 cases an annual bonus of from 8s. to 10s. was paid to satisfactory workers at the end of the harvest. 29 farmers were operating the deferred payments system for Nyasaland labour.

**Wages in Kind.**—Except in one instance where the ration issue consisted of 16 lbs. of mealie meal per week and 1s. 3d. in lieu of other rations, the food position was the same as on the tobacco farms. There was, however, no sugar issue, and the issue of part rations to the non-working wives of married boys was rare. Regular free issues of soap or tobacco were also rare.

**Housing** was provided in all cases. On one farm the quarters were of brick under asbestos. In all other cases, houses were of pole and dagga. In 14 cases the provision was described as in every way satisfactory, and in 14 more as "tumbledown." The remaining compounds consisted of huts in the condition usually associated with native farm compounds.

As in the case of the tobacco farms, we found the practice of advancing cash to employees very widespread. Indeed on no farm was indebtedness absent. The highest amount known to be involved was £7, with £4 being quite common.

It was found that some farmers are under the mistaken belief that by advancing large sums of money workers are tied to the farm until they have paid off their debts. They little realise that the debtor can at any time give one month's notice to terminate his contract and that the practice of advancing large sums of money often leads to desertion when the burden becomes too great.

Thirty of the farms ran a farm store and five had farm schools with teachers. Almost all farms provided rough medicinal and first aid facilities. Six farms made issues of working clothes. Christmas gifts were the rule on 65 per cent. of the farms, and most farmers allowed ample garden facilities for the use of the compound.

**Labour Shortage and Method of Recruitment.**—In respect of casual or seasonal labour only 14 farmers, or under 18 per cent. complained of a shortage, and in all these cases the additional requirement quoted was small.. It will be observed that this factor is closely linked with the presence in the compound of a high proportion of families.

The position with regard to permanent labour was, however, very different. Exactly half of the farmers complained of serious labour deficiencies for their present commitments, and a further 20 per cent. stated that no additional development was possible. It is likely that this state of affairs accurately reflects the fact that this type of farming, especially in areas in close proximity to tobacco areas, is probably unpopular from the labourers' point of view. Thus, whereas recruited labour is the exception in the tobacco group, in this group it is the rule and over 50 per cent. of the farmers had labour recruited either by the Rhodesia Native Labour Supply Commission, or obtained as rejects from the Witwatersrand Native Labour Association. This recruited labour accounted for virtually all the new labour on these farms. Whilst there was a preponderance of voluntary labour overall, this had invariably been on the farms for a number of years.

## SECTION VIII.

## LABOUR UTILISATION ON MAIZE FARMS.

**European Labour.**—Two of the farms visited were run by two men in partnership, the remainder being one-man farms. Sixteen farmers each employed a manager, i.e., only seven less than in the tobacco group, but whereas the latter group employed 45 assistants on 35 farms, here there were only 18 assistants in employment. Eleven pupil farmers were employed, all on tobacco. Two coloured workmen were employed. The rates of pay for managers varied from £30 to £50 per month plus bonuses of from 10 per cent. to 30 per cent. of profits. Keep and accommodation was provided in addition. This position is very much in line with that on tobacco farms, as is that in relation to assistants. Here the scale of pay varied from £15 to £30 per month usually with a small annual bonus in addition.

Again close scrutiny was made into managerial practice. In 25 per cent. of cases this was described as satisfactory. The higher managerial standard on this type of farm is probably due to the greater diversity and the impelling need for the farmer's own labour in most branches of his enterprise. But the general position is still unsatisfactory. In 5 per cent. of cases supervision was regarded as hopelessly inadequate, and in 70 per cent. of cases would only be regarded as "moderate to slack." No body of men complains more loudly about the inefficiency of native labour than the farming community. They can expect little else so long as the guiding strength is lacking at the top.

The native labour position was carefully investigated on the basis of the labour efficiency standards described in full in a previous report (May-June issue of the "Rhodesian Agricultural Journal"). 48 per cent. of the maize farms investigated were clearly short of labour—a total deficiency of 253 boys. The remaining 52 per cent. had an apparent labour surplus—a total of 510 boys. (It will be recalled that the tobacco group showed a deficiency on 37 per cent. of farms—320 boys, and a surplus of 63 per cent.—1,403 boys.) In six of these cases the farmer did not agree that he suffered from any shortage, and in all these cases it was found that he exercised relatively close supervision. In all other instances the farmers expressed agreement with our assessment of the position.

It may be said that, taking this farming group as a whole, it does not suffer at present from any serious overall labour deficiency. Indeed, over all, there is an apparent surplus. The group is, however, steadily losing ground in competition with tobacco farming, and with industry, and many farms are already genuinely and seriously short. It is possible here that the position may be eased by increasing mechanisation.

## SECTION IX.

### MECHANISATION ON MAIZE FARMS.

Complete mechanisation of maize growing from the ploughing to the bagging stage is now possible. In this connection a successful experiment was carried out during the 1948-49 growing season on the Government Experimental Farm at Gwebi.

A 65 acre field was ploughed by means of a 25 h.p. D.2 Crawler Tractor pulling a three-furrow disc plough. Its performance was recorded on an hour-meter as 109 hours for the full job, or an average of about 3/5ths of an acre per hour. Forty-three more hours were taken up by the application of 200 lbs. of fertiliser per acre turned in to a depth of four inches by a one-way disc. The land was then left until four days after the first suitable planting rains. Germinated weeds were then killed by pre-cultivation with two eight inch disc harrows attached to the Multiple Hitch, a matter of 16 hours' work. A four-row maize planter with alternate hoppers then planted the maize at eight inch intervals in rows six inches to eight inches apart in 17 working hours.

When the plants were four inches to six inches in height the young maize was cultivated by attaching four extended spring-tooth harrow sections to the Multiple Hitch. In spite of the fact that the smallness of the plants reduced the speed of cultivation in order to prevent burying, four six inch to eight inch rows could be cultivated in one operation and the whole acreage only took 11 hours to cover.

The second cultivation was carried out in exactly the same way in eight working hours, there being no danger of burying.

The third cultivation was performed by using the front section of a six foot six inch Tandem Disc harrow with the outside discs removed so as to minimise any damage to the plant roots. The discs were set so as to throw up a ridge against the maize plants, this having the effect of smothering the small weeds growing in the rows and at the same time, by giving added support to the plant, minimising wind-blown maize lodging. (This operation, weather permitting, is best performed when the plants are waist high.) The Crawler used, kept in fourth gear, covered the whole 65 acres in 20 hours, both in the initial and the repeat cultivation.

A total of 40 hours were employed in giving two effective light cultivations for Witch Weed, using an extended section of a spring-tooth harrow.

The harvesting, witnessed by a large gathering of farmers, was entirely mechanical, and although three different Maize Pickers were tested in a demonstration alongside, a single-row maize picker was used for the experiment. This worked very successfully while the maize had an 18-20 per cent. moisture content, but once the moisture content dropped below this level the stalks became too brittle for successful picking. This operation involved 66 hours and the entire work on the crop a total of 350 hours.

It is appreciated that an isolated example of this kind is of little significance, and it is known that, in so far as the farm growing under 300 acres of maize is concerned, full mechanisation would not be economic unless the picking could be done by contractors. But the thing is now a practical possibility. Hybrid maize is more suited to mechanical harvesting than the longer-stalked varieties, and owing to the increasingly acute labour situation, mechanical picking may become imperative for the large growers. But even short of this final development, there is ample scope for mechanisation.

The balance of technical and farming opinion accepts the need for labour economy at the ploughing, planting and harrowing stages, and maintains that such economy is a pre-essential of any further development.

On average there were two tractors per farm, though in detail three farms used only ox labour, whilst one farm had five tractors, one had four, and ten had three. Thus there were more tractors than in the tobacco group. This is partly due to the substantially large acreages handled and for the rest is due to the heavier soil types. The capitalisation in tractors was, however, lower at £172 per 100 acres than in the tobacco group (£366). Most of the tractors were relatively old models in comparison, but the main reason for the lower capitalisation per 100 acres is to be found in the fuller and more efficient utilisation of the tractors available. Over three-quarters of the farmers used tractors for more than 50 per cent. of their arable work.

The total capitalisation in machinery was £536 per 100 acres in this group as compared with £708 in the tobacco group. A range from £1,322 at one end to £202 at the other end was noted.

Just under half of the farmers contacted stated that they did not contemplate any further degree of mechanisation, whilst the remainder were expanding.

**Recommendations.**—There can be little doubt that the labour position on maize farms, though not yet generally acute, is deteriorating. Conditions of employment compare unfavourably with those offered on tobacco growing farms, particularly in respect of hours of labour, and the supply of new labour, in particular, is uncertain. In the face of the superior attractiveness of other fields of employment there is little that the maize producer can do in obtaining labour, but he can, and must, do more to ensure that he retains his existing supply and use that supply to greater advantage.

The greater stability of labourers settled with their families is too great to be ignored, and the provision of adequate housing and garden facilities, and minor social amenities such as farm stores, schools, and clinics have been proved to be great inducements in this direction. This, combined with basic training of labour and sympathetic but firm supervision would seem to provide a great part of the answer over the next few years. For the rest, maize growing is a most promising field for effective mechanisation. Farm incomes are good and stability is assured. "Mechanisation now" should be the slogan of the maize grower who does not wish to be out of production in a few years' time.

# The Production of Fire Cured Tobacco

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In 1949 a detailed study was made of the methods of production employed by growers of fire-cured tobacco in Southern Rhodesia, and the full report entitled "A Survey of the Fire-Cured Tobacco Industry" was published for sale by the Fire-Cured Tobacco Standing Committee.*

The work was repeated during the year 1950, so that data is now available for a crop grown under severe drought conditions and also for one grown under normal rainfall. As cultural and curing practices did not differ fundamentally during the two seasons, no attempt is being made to re-describe individual methods; but, instead, the methods which appear to give the best results have been selected and are described hereunder. Newcomers to the industry, however, are advised to read the original report in conjunction with this.

**Soil.**—Production is at present centred almost exclusively in the Shamva-Poti Valley Area, but there is no reason why the crop should not be grown successfully in those other parts of the country where soil, rainfall and altitude are suitable.

Under Southern Rhodesian conditions the best results have been obtained from clays and clay loams, but sandy clay loams, provided they are fertile and very fine-grained, are also capable of producing good quality tobacco. In fact, it is this type of soil which is selected for fire-cured tobacco in Nyasaland (see Appendices 1 and 2). Compared with similar Southern Rhodesian soils, however, the Nyasaland sandy clay loams as shown in Appendix 2 have a higher nitrogen and phosphate content.

Based on the results of examination and analysis of soil samples taken during the years 1949 and 1950, there appears to be a very marked correlation between quality and the calcium content of the soil. As the calcium content increases so the quality of the cured leaf appears to improve. Even at the highest levels reached (33.0 and 30.0 mgm. e.q. %) there has been no evidence of any lime deposit on the surface of the leaf.

These observations indicate the necessity for the immediate investigation of the effect of initial acidity on the calcium and magnesium requirements of the fire-cured tobacco plant.

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* "A Survey of the Fire-Cured Tobacco Industry," by J. C. Collins; Price 5s. Obtainable from the Secretary, Fire-Cured Tobacco Standing Committee, Tipperary, P.O. Shamva.

In the appendix to this article will be found tables showing the analyses of typical fire-cured soils in Southern Rhodesia and Nyasaland; these are being published so as to form a useful basis of comparison for growers who have had their own soils analysed.

**Altitude and Rainfall.**—As production has been more or less confined to the Shamva-Poti Valley Area, not much data is available in regard to the range of altitudes within which fire-cured tobacco can be grown successfully under Rhodesian conditions; but, based on the results of trials conducted by farmers in other parts of the Colony, it is safe to say that altitudes of 2,000 to 4,000 feet are satisfactory, with the optimum being in the neighbourhood of 3,000 to 3,500.

Although experience has shown that fire-cured tobacco is capable of withstanding severe drought, and under such conditions will produce a remunerative crop, whereas maize will tend to become a failure, it is advisable that production be restricted to the 30 to 40 inch rainfall belts.

**Seed-Beds.**—Standard seed-bed practices have been observed throughout.

**Rotation of Crops.**—In assessing the value of a crop rotation, there are so many factors involved, including the very important one of soil type, that it is impossible from a survey of this nature to determine which rotation is best suited to the production of quality and yield in fire-cured tobacco.

The following table depicts the position occupied by tobacco in the rotations practised on the different farms visited during the seasons 1948-49 and 1949-50:—

| | Number of Farms | |
|---|---|---|
| | 1948/49 | 1949/50 |
| Tobacco follows maize | 16 | 9 |
| ,, ,, a green manure crop | 3 | 6 |
| ,, ,, leguminous stubble | 3 | 3 |
| ,, ,, tobacco (2nd successive crop) | — | 2 |
| ,, ,, natural fallow | 1 | 1 |
| ,, ,, cotton | 1 | — |

Of the five best quality crops produced during 1948-49, three followed maize, one followed velvet bean hay, and one followed sunn hemp ploughed under. The corresponding figures for 1949-50 are tobacco following maize on four occasions and tobacco following a green manure crop (velvet beans) on one occasion.

**Spacing.**—Here again, owing to lack of field statistics, it is not possible to do more than generalise on the various spacings employed by growers. The extent to which each is favoured is shown in Table I.

### TABLE I—SPACING.

| | Used by | |
|---|---|---|
| | 1948/49 | 1949/50 |
| 3-ft. x 3-ft. | 4 growers | 2 growers |
| 3-ft. 2-in. x 3-ft. 2-in. | 1 grower | — |
| 3-ft. 4-in. x 3-ft. 4-in. | 1 ,, | 2 growers |
| 3-ft. 6-in. x 3-ft. | 3 growers | 2 ,, |
| 3-ft. 6-in. x 3-ft. 6-in. | 5 ,, | 6 ,, |
| 3-ft. 9-in. x 3-ft. | 1 grower | — ,, |
| 4-ft. x 3-ft. | 3 growers | 3 ,, |
| 4-ft. x 3-ft. 6-in. | 2 ,, | 2 ,, |
| 4-ft. x 4-ft. | — ,, | 1 grower |
| 5-ft. x 3-ft. | 1 grower | — ,, |
| Alternating 3-ft. 6-in. & 4-ft. 6-in. x 3-ft. | 1 ,, | 1 ,, |
| Alternating 2-ft. 6-in. & 4-ft. 6-in. x 3-ft. | 1 ,, | 2 growers |
| Alternating 2-ft. 6-in. (reducing to 1-ft. 6-in.) & 4-ft. 6-in x 3-ft. | — ,, | 1 grower |

A spacing of 3-feet x 3-feet is generally considered to be too close for fire-cured tobacco. It is not the question of the incidence of disease which prompts this opinion but the question of the damage sustained by the plants during reaping.

One grower divided his field into two portions, the soil in each being similar in type, and on the one he used a spacing of 3-feet 6-inches x 3-feet 6-inches and on the other a spacing of 4-feet x 3-feet 6-inches. Each plot received the same fertiliser treatment, but unfortunately the dates of planting differed, so that the variations noted in the two sections cannot conclusively be attributed to spacing. However, the following observations were made:—

(a) In the plot with the wider spacing the plants were very much superior in general shape.

(b) Unfortunately the grower was unable to keep detailed data in regard to grades and yield, but he did observe that there was no significant difference in yield between the two treatments, and that though the lower leaves in the 3-feet 6-inches x 3-feet 6-inches spacing were slightly thinner in texture than the corresponding leaves in the 4-feet x 4-feet spacing, this difference did not apply to leaves from higher up the plant.

For convenience of reference, the remarks made in the report on the survey conducted during the season 1949 in regard to those spacings in which the distance between rows alternate whilst the spacing of the plants in the row remains constant, are repeated here, as again this season the same points have been observed:—

(1) There is no evidence of border effect. Special care was taken to see whether or not this would be the case. The plants grew well and without any tendency to rankness or flaring.

(2) Comparing a spacing of 3-feet x 3-feet with one in which the rows alternate at intervals of 2-feet 6-inches and 4-feet 6-inches whilst the distance between plants in the row remains constant at 3-feet, there are 700 less plants per acre in the latter treatment, representing a decrease of 14 per cent.

(3) As there is a "path" 4-feet 6-inches wide on each side of every set of two rows, labourers have plenty of freedom of movement and consequently losses through damage to the plants must be greatly reduced.

(4) In the preparation of the land for planting on ridges, the method of alternating the distance between rows in the manner indicated, is more economical than making ridges 3-feet apart, as it effects a saving of 35,000 yards of ridging in 50 acres.

The yardage of ridging is identical with ridges spaced 3-feet 6-inches apart.

(5) At the time of reaping, an economy in labour can be achieved by eliminating the necessity for waiters, as crates can be placed along the 4-feet 6-inches paths at intervals convenient to the reapers.

A spacing of this nature should most certainly be included in a programme for future research.

A point of academic interest is that in a spacing of this nature, even when the distance between the alternate rows is reduced from 2-feet 6-inches to 1-foot 6-inches there was no sign of white mould nor any increase in any other disease, even though the leaves were over-lapping and climatic conditions were at times ideal for the development and spread of disease.

Before leaving this section it is necessary to state that, in general, the grower normally assesses his requirements of artificial fertiliser on the acreage basis rather than on the number of plants per acre. In other words, a given quantity of fertiliser will be applied per acre regardless of what the spacing is.

**Manurial Treatment.**—In the report on the survey conducted during 1949, it was suggested that applications of less than 250 lbs. per acre of Standard Tobacco "B" Mixture (P.N.K. 13-3-8) might possible be inadequate. In the light of the studies carried out by the Southern Rhodesia delegation in Nyasaland during 1950, however, there is reason to consider that even 250 lbs. per acre might prove to be excessive and that the large dressings we are accustomed to giving in Southern Rhodesia might be one of the causative factors for the production of undesirably coarse midribs and veins.

In the absence of experimental data no recommendations can be made at this stage, but growers are reminded that it is fundamentally important that the growth of the tobacco plant should proceed steadily without any setback, and that this can best be achieved by giving the fertiliser in fractional applications rather than in one instalment.

The methods employed by twelve growers are summarised in Table II, which should be of particular interest as it takes into account soil type, soil fertility in relation to the three major constituents—nitrogen, phosphate and potash; the effect of the crop immediately preceding tobacco, and the rates and times of application of fertiliser. An explanation is required in regard to the first column "Quality of Crop." At the time of sale on the auction floors, particular attention was paid to the quality of leaf arriving from 21 different farms, and at the end of the season all 21 were listed according to their order of merit. Out of the 21 crops examined in particular only 12 are listed in the table, as no data on soil analysis is available for the remaining nine. The quality description in the column, however, is the position occupied by the crop in relation to all 21.

It is emphasised that the information contained in the table must be treated with great reserve and that no recommendations can be made until scientifically laid out experiments have been conducted.

The fact that crops of quality 14 and 17 were grown on very fine grained sandy clay loam and sandy loam should not be taken to mean that soils of this type are unsuitable for fire-cured tobacco. On the contrary, this is the type of soil on which fire-cured tobacco is grown in Nyasaland, and, in 1948-49 in Southern Rhodesia, a crop of very high quality was grown on a very fine grained sandy clay loam.

**Field Routine.**—This section really resolves on whether the crop is planted on the flat or on ridges or hills. Selection between ridges and hills is more a question of the personal choice of the individual, as there is no fundamental difference between them provided each is properly constructed. In making the choice, naturally the question of soil conservation must be considered.

The spell of continuous wet weather experienced during the transplanting stage in the season 1949-50 proved that planting on the flat can be very dangerous if such climatic conditions develop, as in every instance where this was done, the stand of plants was poor.

**Priming and Topping.**—It is a moot point as to whether or not the practice inaugurated by certain growers of leaving the primings or lowest leaves on the plant sufficiently long to approach ripeness for reaping and curing, is not one of the principal causes of such a high percentage of really low-grade leaf being offered for sale.

The persons who favour this practice aver that if there is a demand for this type of leaf, as apparently there is, why not sell it instead of throwing it away? It requires a series of carefully laid out experiments to determine whether such procedure is

## TABLE II.

| *Quality of Crop* | *Soil Type* | *SOIL* | | | *Tobacco Follows* | *FERTILISER APPLICATION* |
|---|---|---|---|---|---|---|
| | | *N %* | *$P_2 05$ mgm eq %* | *$K_2 0$ mgm eq %* | | |
| 1st | Clay | 0.15 | Less than 1 | 0.3 | M | 100 lbs. per acre "B" Mixture in two applications (A). |
| 2nd | Clay | 0.17 | 1 | 0.2 | M | 100 lbs. per acre "B" Mixture before planting (B). |
| 3rd | Clay loam | 0.16 | Less than 1 | 0.4 | M | 200 lbs. per acre "B" Mixture in three applications (B+A). |
| 4th | Clay | 0.22 | 1 | 0.2 | GM (VB) | 350 lbs. per acre "B" Mixture in two applications (A). |
| 5th | Clay loam | 0.11 | Less than 1 | 0.3 | M | 75 lbs. per acre "B" Mixture in one application (A). |
| 7th | Clay | 0.11 | 1 | 0.2 | T | 150 lbs. per acre "B" Mixture in one application (A). |
| 8th | Clay loam | 0.12 | 4 | 0.2 | M | 200 lbs. per acre "B" Mixture in two applications (A). |
| 11th | Clay | 0.11 | Less than 1 | 0.5 | ½M<br>½GM(VB) | 200 lbs. per acre "B" Mixture in one application (A). |
| 12th | Clay loam | 0.11 | 1 | 0.2 | GM (VB) | 200 lbs. per acre "B" Mixture in two applications (A). |
| 13th | Clay loam | 0.10 | 2 | 0.3 | M | 200 lbs. per acre "B" Mixture in one application (A). |
| 14th | Very fine grained S.C.L. | 0.06 | Less than 1 | 0.2 | T | 200 lbs. per acre "B" Mixture (B+A);<br>50 lbs. per acre top dressing (A). |
| 17th | Very fine grained sandy loam | 0.07 | 1 | 0.3 | GM (SH+CP) | 200 lbs. per acre R.R.P. (B); 5-7 tons per acre KM (B); 400 lbs. per acre "B" Mixture; in two applications (B+A). |

A = after planting B = before planting SCL = sandy clay loam M = maize T = fire-cured tobacco CP = cowpeas
VB = velvet beans ploughed under RRP = raw rock phosphate GM = green manure crop KM = kraal manure SH = sunn hemp

really economically sound. Not only does the delayed presence of such leaves on the plant render it more susceptible to disease infection, but it also probably exerts a depressing effect in regard to yield and quality on the more desirable type of leaf higher up the plant.

Quite possibly the recent increase in the percentage of spotted leaf, so much disliked by buyers, is the outcome of this particular practice.

It is interesting to note that in Nyasaland the crop is primed high.

**Topping.**—Naturally no hard and fast rule can be made to apply to topping, as the operation is so dependent upon the standard of growth made by the plant and on seasonal conditions, but it is interesting to note the methods employed in the case of the five best quality crops grown in the two seasons 1948-49 and 1949-50. These are depicted in Table III.

The attention of growers is drawn to the fact that the stage at which the plant is topped is of as great importance, if not more important, than the height to which it is topped.

TABLE III—PRIMING AND TOPPING.

| *Quality of Crop* | *Extent of Priming at Topping Time* | *Stage of Topping* | *Nature of Topping* | *No. of Leaves Remaining* |
|---|---|---|---|---|
| | | **1948-49** | | |
| 1st | High | Between bud and full flower | Low | 10-12 |
| 2nd | Not primed | Full flower | Low | 12-15 |
| 3rd | Fairly high | Full flower | Fairly low | 13-14 |
| 4th | High | Early flower | Low | 8-10 |
| 5th | High* | Full flower†<br>Bud stage‡ | Low | 10-12 |
| | | **1949-50** | | |
| 1st | Low | Early flower stage | Fairly low | 14-18 |
| 2nd | High* | Early to full flower stage | Low | 10-12 |
| 3rd | High | Early flower stage | Low | 9-12 |
| 4th | High | Early flower stage | Low | 10-12 |
| 5th | Low | Early flower stage | High | 14-18 |

* By priming a week after topping he finds that these primers cure better than if reaped at the time of topping.

† Early in season.

‡ Later in season.

**Seed Selection.**—It is interesting to note that very few growers purchased seed for the season 1949-50, as the vast majority had selected seed from their own crops. Two growers imported seed for themselves from Nyasaland.

Although growers are extremely conscientious in the manner in which they select seed plants, it is unfortunate that many of them are not sufficiently experienced in plant breeding to select really desirable types.

This question of seed selection is such an important one that the warning given in the report for 1948-49 is repeated here: "Whilst the industry is so localised and the number of growers so limited, the Fire-cured Tobacco Growers' Committee would be well advised to consider some scheme to ensure a measure of control over seed selection and disposal. This is an extremely important point and one which should receive early consideration, because once the industry expands and extends to other areas, the more difficult will it be to effect the necessary control."

**Harvesting.**—With the exception of two growers who harvest the whole plant by severing the stalk, all others reap the leaves individually. With increasing labour shortage, more and more growers are arranging their reaping so that the whole plant can be stripped of its leaves in one or two operations.

**Curing.**—The points emphasised in the 1948-49 report are equally applicable to the season 1949-50.

The individual methods employed by the growers of the three highest quality crops are described below:—

**Method No. 1.**—The barn is packed with the sticks spaced on the tiers at intervals of nine inches. Next, the ventilators and door are closed and the latter is sealed with "dagga" if it is not a close fit for the frame. The tobacco is allowed to yellow, which it does in five or six days. By the end of this period browning will have commenced and light smoke fires are then lit inside the barn, using maize cores as fuel. The top ventilators are opened one quarter, depending upon the condition of the leaf. Should the tobacco feel too moist, the ventilation will, of course, be increased.

The ventilators and door are opened for a few hours at four or five o'clock each afternoon during the colouring (i.e., the smoking) stage and are closed for the night.

Fires are not tended at night but are allowed to die down.

When the leaf has taken up full colour, the smoke fires are drawn and the midribs and web are dried with the aid of flues starting at a temperature of 110°F. As soon as the leaf appears completely dry the temperature is raised to 120°F.

The barn is allowed to cool for 24 hours, and the leaf is then brought into handling condition by spraying it with water from the top tier.

For preference this spraying is done in the afternoon, and as soon as the operation has been completed the barn is sealed and left till the following morning, by which time the leaf should be in suitable condition for removal to the bulking shed. If it is not, low pressure steam is introduced.

**Method No. 2.**—As soon as the barn has been packed the ventilators and door are closed, and the leaf is left to yellow with the temperature of the barn maintained at 90°F. with the aid of heat radiated through flues. No moisture is introduced into the barn.

When the leaf has yellowed and browning is fairly pronounced, which on an average takes eight to ten days, seven smoke fires art lit inside the barn, using for fuel, maize cores which have been soaked in water. Top and bottom ventilators are opened as soon as smoke is introduced.

The leaf is smoked for three days, and at the end of the third day the temperature is raised to 100° with the aid of flues and maintained at this level for about ten hours. It is then raised to 110° and held there for about twelve hours. All this time the smoke fires produce a light smoke and burn continuously throughout the day and night.

The next step is to remove the smoke fires and raise the temperature to 120° and then by increments of 5° every four hours to a maximum of 135° in order to dry out the midribs.

When the barn is at 135° the bottom ventilators are closed, and when the midribs of the leaves near the door and adjacent to the walls are beginning to dry, the top ventilators are also closed.

The leaf is conditioned for removal from the barn by spraying it with water.

**Method No. 3.**—At the beginning of the season the barn is so packed that the tobacco-laden sticks are spaced on the tier at intervals of approximately 10 inches, but towards the end of the season they are packed closer together at intervals of roughly 7½ inches.

The curing process resolves into wilting or yellowing the leaf for approximately four days, then subjecting it to smoke each alternate day until full colour is obtained, and then finally drying the web and midribs with open fires. It is interesting to note that the temperature within the barn is not lowered suddenly each evening by opening the ventilators and door for an hour or so as most growers do after the fires have been drawn, but is reduced gradually and automatically over a period of 24 hours with the ventilators and door closed.

The following chart is very typical of the method of curing employed by this particular grower:—

6th April: Barn filled. Ventilators and door closed. Leaf left to yellow for 4 days.

10th April: Commence smoking the barn by lighting four fires inside it producing a dense smoke from green timber. Draw the fires at night. The ventilators and door are not opened.

11th April: Barn kept closed. No smoke.

12th April: Smoke re-introduced, this time from six fires producing only a light density. The fires are drawn at night. The ventilators and door are not opened.

13th April: Barn kept closed. No smoke.

14th April: Smoke re-introduced, this time from eight fires producing a light density. The fires are drawn at night. The ventilators and door are not opened.

15th April: Barn kept closed. No smoke.

16th April: A light volume of smoke is produced again from eight fires which are drawn at night. The ventilators and door are not opened.

17th April and onwards: Fire the barn every day until full colour in the leaf is obtained. Then open the top ventilators and dry the midribs with open fires burning all 24 hours of each day for as long as is necessary. Flues are not used.

The leaf is conditioned for removal from the barn by using low pressure steam. However, if it is proving difficult to take up condition, it is lightly sprayed with water.

**Grading.**—There was a very marked improvement in the standard of grading during the 1949-50 season. The most common fault is the mixing of colours and particularly the inclusion of green with coloured leaf.

Lack of proper organisation in the grading shed is perhaps the main cause for the occurrence of faulty grading. There are several growers who allow their graders to squat where they choose on the floor of the shed, with the result that proper supervision becomes impossible and the percentage of discard is greatly increased. Tables are essential, and it is imperative to bear in mind that grading is very greatly simplified if the contents of each barn or, if leaf of similar type, is bulked separately.

During grading the factors to bear in mind are:—

1. Body and texture.
2. Colour.
3. Length.

As far as body and texture are concerned, fire-cured leaf should be divided into lugs, thin leaf and heavy leaf. The main divisions of colour are "light," "brown," "dark," "green," and "variegated." By "light" is meant leaf of cinnamon shade, and by "dark," leaf which is dark chocolate to almost black. Regarding "greens," differentiation must be made between "olive" and "raw green."

There is a very close correlation between body and colour, so that lugs and thin leaf normally fall into "lights" and browns," whereas heavy leaf is generally "brown" or "dark." Green is usually indicative of the leaf having been reaped before it was truly ripe.

On the basis of length, the leaf should be divided into the four groups, 24 inches and over, 20 to 24 inches, 16 to 20 inches, and shorts.

The main criterion is that the grower must be careful to see that each bale contains only leaf which is similar in body and texture, colour shade, and length range.

During the 1949-50 season there was a high percentage of spotted leaf offered for sale, and it is in the grower's interest to separate such leaf from sound leaf, as it has a tendency to tear in the spotted areas when being stripped, and in consequence detracts from the value of the sound leaf.

**Presentation for Sale.**—To much emphasis cannot be laid on the importance of submitting for sale bales which are neat and uniform. The action taken by the Fire-Cured Tobacco Growers' Standing Committee over the last two seasons, in reporting to growers on the quality and standard of manipulation of their individual consignments, has been responsible for the very marked improvement evidenced over the auction floors.

The two points still requiring attention are condition and tying. To show to advantage, fire-cured tobacco must be in slightly higher condition than flue-cured Virginia, but this does not mean that it should be wet.

As far as tying is concerned the main faults are:—

(a) Butts of hands too large, due to too many leaves being tied in a hand, or, as is more often the case, the butts not being tied firmly enough.

(b) The tie hand being not deep enough or else being too deep.

The butts should measure about one inch across and the binder or tie band should start at the extreme end of the butt and continue for one and a half to two inches up the hand. Bind firmly.

**Classification.**—In order to obtain more detailed information on the quality of the crop, a system of classification based on the American system was introduced on the auction floors during the season 1950 with the permission of the Tobacco Marketing Board.

Unfortunately the writer was the only person available for this duty, and as his time was also occupied by matters relating to other branches of the tobacco industry, it was not possible for him to attend all sales. Further, as the scheme did not come into operation until several sales had already been completed it was not found possible to classify more than eight per cent. of the total of 6,380 bales sold during the season. All sales conducted after the 23rd June, 1950, were ignored, as it was considered that consignments offered after that date were the tail end of individual lots and the prices obtained for them were out of all proportion to those received earlier in the season. To have included them would have distorted the true value per grade.

The figure of eight per cent. is too low to be really representative of the crop, but the information obtained is of sufficient interest to be included in this report. The procedure adopted was to classify every third bale on several sale days and, therefore, within this margin of eight per cent. the sample can be regarded as truly randomised.

| Leaf Type | Grade | No. of Bales | Price Range (pence per lb.) to nearest farthing | Assessed Average Price (pence per lb.) |
|---|---|---|---|---|
| LUGS | X1L | — | — | — |
| | X1F | 14 | 20—$24^2$ | 22.2 |
| | X1D | 4 | $22^2$—24 | 23.0 |
| | X2L | 1 | $22^2$ | 22.5 |
| | X2F | 21 | $9^2$—$20^2$ | 18.6 |
| | X2D | 15 | 16—$20^2$ | 19.3 |
| | X3L | 2 | 15—$15^3$ | 15.5 |
| | X3F | 15 | 12—$19^2$ | 17.1 |
| | X3FV | 1 | $17^3$ | 17.7 |
| | X3D | 23 | 10—$20^2$ | 16.7 |
| | X3M | 1 | $15^1$ | 15.2 |
| | X3G | — | — | — |
| | X4L | 1 | 14 | 14 |
| | X4F | 16 | $12^3$—$15^1$ | 13.4 |
| | X4FV | 1 | $13^1$ | 13.2 |
| | X4D | 30 | 11—$16^3$ | 13.9 |
| | X4M | 1 | 12 | 12 |
| | X4G | — | — | — |
| | X5L | — | — | — |
| | X5F | 1 | 10 | 10 |
| | X5FV | — | — | — |
| | X5D | 4 | 10—$12^1$ | 11.5 |
| | X5M | 1 | 11 | 11 |
| | X5G | 4 | $8^3$—12 | 10.2 |
| THIN LEAF | C1L46 | 3 | $29^2$—30 | 29.6 |
| | C1F46 | 5 | $26^2$—$27^2$ | 26.8 |
| | C1F45 | 1 | 25 | 25 |
| | C2L46 | 3 | 22—$27^2$ | 24 |
| | C2L45 | 3 | $20^2$—27 | 23.3 |
| | C2L44 | 3 | 20—22 | 21 |
| | C2F46 | 36 | 17—28 | 24.3 |
| | C2F45 | 12 | $14^2$—26 | 22.2 |
| | C2F44 | 1 | $21^2$ | 21.5 |
| | C2D46 | 7 | 15—25 | 21 |
| | C2D45 | 4 | 14—27 | 22.7 |
| | C2D44 | 1 | 24 | 24 |
| | C3L46 | 1 | $24^2$ | 24.5 |
| | C3L45 | 3 | 20—26 | 22.6 |
| | C3L44 | 2 | $19^3$—$21^2$ | 20.5 |
| | C3F46 | 36 | $14^1$—$24^2$ | 19.5 |
| | C3F45 | 34 | 11—$27^2$ | 20.1 |
| | 3CF44 | 9 | $16^3$—$20^2$ | 18.0 |

| Leaf Type | Grade | No. of Bales | Price Range (pence per lb.) to nearest farthing | Assessed Average Price (pence per lb.) |
|---|---|---|---|---|
| THIN LEAF | C3FV46 | 2 | $13^2$—$16^1$ | 15.0 |
| | C3FV45 | 4 | 13—$20^2$ | 16.5 |
| | C3FV44 | 2 | $16^1$ | 16.2 |
| | C3D46 | 23 | 15—26 | 20.3 |
| | C3D45 | 14 | 15—$24^2$ | 19.6 |
| | C3D44 | 4 | 15—21 | 16.7 |
| | C3M46 | 1 | $14^1$ | 14.2 |
| | C3M45 | 3 | 18—21 | 20 |
| | C3M44 | 2 | 17—$22^3$ | 19.5 |
| | C3K45 | 4 | 12—$16^1$ | 13.2 |
| | C4L46 | 1 | $16^3$ | 16.7 |
| | C4F46 | 7 | $12^3$—28 | 16.1 |
| | C4F45 | 24 | 12—$27^2$ | 15.8 |
| | C4F44 | 5 | $12^1$—$19^1$ | 16.2 |
| | C4FV46 | 1 | 10 | 10 |
| | C4FV45 | 4 | 11—$15^2$ | 13.5 |
| | C4FV44 | 3 | 10—14 | 12.0 |
| | C4D46 | 14 | $11^3$—20 | 16.3 |
| | C4D45 | 30 | $12^2$—24 | 15.3 |
| | C4D44 | 19 | 10—18 | 13.8 |
| | C4M46 | 2 | 14—$15^1$ | 14.5 |
| | C4M45 | 3 | $13^3$—$15^2$ | 14.3 |
| | C4M44 | 1 | 12 | 12 |
| | C4G45 | 2 | 13—$13^2$ | 13 |
| | C5F45 | 1 | $13^3$ | 13.7 |
| | C5FV45 | 1 | 10 | 10 |
| | C5D45 | 5 | 10—$11^1$ | 10.6 |
| | C5D44 | 4 | 10—13 | 11.2 |
| | C5G46 | 1 | 6 | 6 |
| | C5G45 | 1 | 10 | 10 |
| | C5G44 | 1 | 12 | 12 |
| HEAVY LEAF | B2F46 | 1 | 22 | 22 |
| | B2F45 | 2 | 15 | 15 |
| | B2D46 | 1 | 24 | 24 |
| | B2D45 | 1 | $27^2$ | 27.5 |
| | B3F46 | 2 | $19^2$—$19^3$ | 19.5 |
| | B5F45 | 1 | $12^3$ | 12.7 |
| | B3D46 | 8 | 14—$21^2$ | 19.0 |
| | B3D45 | 7 | $12^3$—20 | 17.1 |
| | B3D44 | 5 | $12^1$—$19^1$ | 16.8 |
| | B4F46 | 1 | 13 | 13 |
| | B4F45 | 2 | 12—14 | 13 |

| Leaf Type | Grade | No. of Bales | Price Range (pence per lb.) to nearest farthing | Assessed Average Price (pence per lb.) |
|---|---|---|---|---|
| HEAVY LEAF | B4D46 | 1 | 14 | 14 |
| | B4D45 | 5 | $12—16^1$ | 14.6 |
| | B4D44 | 3 | $16^3—18$ | 17.3 |
| | B4M46 | 2 | $15^3—18$ | 17.0 |
| SHORTS | T3F | 6 | $15^2—20$ | 17.6 |
| | T3D | 7 | $8^1—21$ | 17.8 |
| | T3G | 1 | $13^1$ | 13.2 |
| | T4F | 3 | $11—12^3$ | 12 |
| | T4D | 6 | $9—20^2$ | 13 |
| | T4M | 1 | $12^3$ | 12.7 |
| | T4G | 1 | 10 | 10 |
| NONDESCRIPT | N1E | 18 | $12^2—18$ | 14.6 |
| | N1D | 3 | $14—14^3$ | 14.3 |
| | N1G | 3 | $9^2—12$ | 10.3 |
| | N2E | 18 | $8—12^3$ | 9.6 |
| | N2D | 24 | $4^2—13^2$ | 9.6 |
| | N2G | 4 | $7—10^3$ | 9.5 |

From the foregoing it can be deduced that:—

Lugs constituted 30.1% of the crop with a price range of 10.2—23 pence.

Thin leaf constituted 43.1% of the crop with a price range of 6—29 pence.

Heavy Leaf constituted 8.1% of the crop with a price range of 12.7—27.5 pence.

Shorts constituted 4.8% of the crop with a price range of 10—17.8 pence.

Nondescript constituted 13.5% of the crop with a price range of 9.6—14.6 pence.

Scrap constituted 0.1% of the crop.

The outstanding features are the high proportion of lugs and nondescript leaf and the very low percentage of heavy leaf; and in turn, this observation emphasises the necessity for a detailed study to be made of the effects of priming at the correct time versus non-priming or delayed priming.

Another important feature borne out by this preliminary classification is that the official American grade classification is extremely well suited to Rhodesian leaf and does not require to be modified in any way. It is better to adhere to a recognised national system than to adopt the standard of grades employed by any one particular individual or commercial concern.

**Acknowledgements.**—Due acknowledgement is made to the Chemistry Division of the Department of Agriculture for kindly analysing the soil samples. To the Chairman and members of the Fire-Cured Tobacco Standing Committee, and to the growers, for their most valuable support and co-operation.

The interest taken by the Trade Section has also been very much appreciated.

## APPENDIX 1.

### RESULTS OF EXAMINATION AND ANALYSIS OF SOIL SAMPLES, SOUTHERN RHODESIA: SEASON 1949-50.

| | ABOVE AVERAGE CROP | | | | AVERAGE CROP | | | | | BELOW AVERAGE CROP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Lab No. | 654/W | 649/W | 656/W | 650/W | 653/W | 652/W | 658/W | 648/W | 657/W | 655/W | 651/W | 647/W |
| Colour | Dark Brown | Dark Greyish Brown | Dark Brown | Dark Brown | Brown | Brownish Red | Dark Brown | Greyish Brown | Yellowish Brown | Pinkish Brown | Reddish Brown | Yellowish Brown |
| Soil Type | Clay | Clay | Clay Loam | Clay | Clay Loam | Clay | Clay Loam | Clay Loam | Clay | V. fine grained sandy Loam | Clay Loam | V. fine grained S.C.L. |
| pH (reaction) | 5.9 Med. Acid | 6.1 Slightly Acid | 6.2 Slightly Acid | 6.1 Slightly Acid | 6.1 Slightly Acid | 6.2 Slightly Acid | 6.0 Slightly Acid | 5.9 Med. Acid | 6.3 Slightly Acid | 5.8 Med. Acid | 6.2 Slightly Acid | 6.3 Slightly Acid |
| Nitrogen % | 0.15 | 0.17 | 0.16 | 0.22 | 0.11 | 0.11 | 0.12 | 0.11 | 0.11 | 0.07 | 0.10 | 0.06 |
| Calcium (mgm. eq. %) | 18 High | 22 V. high | 16 High | 24 V. high | 10 Normal | 22 V. high | 15 Normal | 8 Normal | 14 Normal | 7 Normal | 14 Normal | ·4 Low |
| Magnesuim (mgm. eq. %) | 2.5 Normal | 4 Normal | 3 Normal | 5 Normal | 2.5 Normal | 5 Normal | 2.5 Normal | 5 High | 2.5 Normal | 1.2 Normal | 4.5 Normal | 3 Normal |
| Potassium (mgm. eq. %) | 0.3 Low | 0.2 Low | 0.4 Medium | 0.2 Low | 0.3 Low | 0.2 Low | 0.2 Low | 0.2 Low | 0.5 Medium | 0.3 Low | 0.3 Low | 0.2 Low |
| Phosphate (mgm. % of $P_2O_5$) | Less than 1 Very Low | ·1 Low | Less than 1 Very Low | 1 Low | Less than 1 Very Low | 1 Low | 4 Low | 1 Low | Less than 1 Very Low | 1 Low | 2 Low | Less than 1 Very Low |

## APPENDIX 2.

### COMPOSITION OF SOIL SAMPLES, NYASALAND.

(Information kindly supplied by Chief Agricultural Research Officer, Nyasaland.)

| Lab. No. | Depth ins. | Colour | Stones p.c. | Acidity pH | Moisture p.c. | Loss on Ignition p.c. | Clay p.c. | Silt p.c. | Fine sand by difference p.c. | Coarse sand (ignited) | Nitrogen (total) N p.c. | Organic carbon C p.c. | C.N. Ratio : 1 | Phosphate (available) P p.p.m. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 321 | 0-6 | Reddish brown | 1 | 6.2 | 1.8 | 8.9 | 26.4 | 7.8 | 27.4 | 36.6 | 0.13 N | 2.2 | 17 | 8 N |
| 325 | 0-6 | Dark brown | 1 | 6.5 | 2.1 | 8.0 | 25.3 | 9.9 | 20.0 | 42.7 | 0.12 N | 1.4 | 12 | 8 N |
| 327 | 0-6 | Reddish brown | 1 | 5.8 | 3.1 | 4.0 | 25.3 | 7.9 | 18.6 | 45.1 | 0.07 N | 0.9 | 13 | 2 XVL |
| 333 | 0-6 | Dark brown | 2 | 6.8 | 1.5 | 7.3 | 20.5 | 9.6 | 25.0 | 43.4 | 0.12 N | 1.8 | 15 | 8 N |
| 339 | 0-6 | Reddish brown | 1 | 5.9 | 2.2 | 9.6 | 33.1 | 13.6 | 18.8 | 32.3 | 0.14 N | 1.9 | 14 | 2 XVL |

All Sandy Clay Loams

# Irrigation in America

By R. H. ROBERTS, Assistant Director of Irrigation.

JULY—SEPTEMBER, 1950.

My visit was paid principally in connection with the proposed Sabi Irrigation Scheme and the establishment there of an Irrigation Experimental Station.

The objectives were two-fold:—

(a) To study irrigation developments and practices in the U.S.A., particularly under conditions similar to those of the Sabi Valley; and

(b) to endeavour to recruit soil scientists to advise on the development of irrigation in the Sabi Valley and to direct the experimental station for the first five years.

For purposes of publication, certain portions of my report, which are not considered of interest to the public, have been omitted, and the remainder of this article consists of extracts from the full report.

## PART I. NARRATIVE.

**Denver, Colorado** (July 29th to August 3rd). On Monday, July 31st, I made contact with the Bureau of Reclamation Regional Office through Mr. David R. May, who is stationed there and who visited Salisbury last year to advise on the Hunyani Poort Dam. After some discussions and arrangements, I visited the Bureau's Federal Centre, some miles out of Denver, where I met Mr. McClelland, the Chief Engineer of the Bureau. The Federal Centre has over 2,000 employees, and is the headquarters of the Bureau's design and research. I spent some time in the Hydraulics Laboratory, and saw many of the scale models under test. I picked up many practical points on the design and equipment of hydraulics laboratories, which will be valuable in designing our own. I saw other laboratory work, such as the "cavitation" testing machine, and the "plastic" workshop. I had discussions on the "vacuum process" for concrete surfaces, and on the design of earth-rockfill dams and canals.

Later, at the Regional Office, I had a brief discussion on economics and an interview with the Information Officer.

On Tuesday, August 1st, I drove to Fort Collins, 66 miles north of Denver, with two Agricultural members of the Reclamation Bureau. There I met Dr. Omar J. Kelley (B.P.I.S.A.E., in charge of Agricultural Research in the 17 Western States), and Dr. Gardner, Professor at the Colorado A. and M. College at Fort Collins. After discussing my problems, we made an extensive tour of the irrigated areas south and east of Fort Collins. Over 400,000 acres are under irrigation now, and new projects are designed to increase this figure to some 600,000 acres. Rainfall is about 15 inches, mainly in winter, and agriculture is confined to about five to six months in the year. Farms are about 80 acres, and are very profitable, land being seldom for sale. There is a diversified agriculture, the principal crops being lucerne and other hay crops, sugar beet, maize, barley, beans, etc. I inspected a large plant for de-hydrating and grinding lucerne. The company owning the plant cuts the lucerne for the farmer, transports it to the plant in tip-trucks, weighs it, de-hydrates it in large cylinders heated by oil blast, grinds it to meal, bags it and loads it into railway trucks. There are many such plants in the State. The meal is used for poultry or dairy feed.

Irrigation is almost entirely of the surface type, either between borders or by small furrows ("corrugations"), and here I first saw siphon tubes of plastic or aluminium being used. They avoid creating "mud-pies" and produce a uniform stream at each point that water is applied. All land is meticulously prepared or levelled (which I found was almost universal in the States), so that labour for irrigating is reduced to a minimum, and "hired labour" is very seldom required.

At this stage it is perhaps appropriate to explain that in every large irrigated area in the U.S.A. the farmers are organised, by petition, into "Irrigation Districts," sometimes eight or ten districts in an area. The Irrigation District is a body corporate, and it raises its revenues by direct charges for water or, in its alternative form of a "Conservancy District," by rates levied on all property in its district. It may, and usually does, own or construct its own works, and it may contract with the Bureau of Reclamation or a water company for the supply of water from outside. **The Bureau does not therefore have direct dealings with individual farmers,** even when it is "operating and maintaining" the system in detail. The Bureau will contract with a "District" on the basis of two forms of payment: (a) the repayment of the assessed reimbursable capital costs of construction, and (b) the payment of annually assessed "operation and maintenance" charges.

In assessing the reimbursable portion of the capital cost, deductions are made from the total capital cost in respect of their assessed value for such national purposes as flood control, recreation and navigation, and also for electric power, if any.

On Wednesday, August 2nd, I was taken on a tour of the Colorado—Big Thompson Project, a series of works being built to produce additional water for the irrigated areas near Fort Collins. This project, briefly, is designed to collect water from the western slopes of the Rocky Mountains, and convey it to the eastern slopes, which are short of water. Water is collected in the Granby Dam, an earth-rockfill structure over 300 feet high. The reservoir is over 8,000 feet above sea-level, and has a capacity of 545,000 acre-feet and a surface area of 7,200 acres. Water is then lifted to a maximum of 186 feet by a pumping plant consisting of three 6,000 h.p. pumps housed in a seven-storey building, and delivered by a canal with a capacity of 1,100 cusecs to Shadow Mountain Dam and Grand Lake. At this point the Rockies are pierced by a tunnel 13 miles long, whence water is delivered to the eastern slopes, down which it proceeds through a series of power-stations (sales of electric power will pay for most of the project), and it ends up in two great reservoirs at the bottom. One of these, the Horsetooth Reservoir, required the construction of four separate earth-rockfill dams. The total cost of the project is 151,000,000 dollars.

**Tucumcari, New Mexico** (August 5th). I called on Mr. Lyman, the "Project Manager" of the Bureau of Reclamation. After some discussion with him and his staff, I was taken to the local Agricultural Experimental Station, but unfortunately the irrigation work is still in its infancy, and there was little to see. In the afternoon I was taken by the "Water Master" on a tour of the project. The project is only three or four years old, and farming was often not of a very high standard, as the water users were frequently inexperienced. An interesting feature of the tour was the fact that every official car has a two-way radio set, so that the office and the travelling staff, including the 14 "ditch-riders," can speak to each other at all times, and the Water Master can give down-to-the-minute instructions to his ditch-riders, and receive their reports, which is of the greatest value in times of emergency, such as canal-breaks, apart from routine use for adjustments of flow, etc.

The Project is supplied with water from the Conchas Dam, on the Canadian River, built by the Army Engineers for flood-control, and therefore "non-reimbursable." The Project at present has reached over 30,000 acres, and is being expanded to 45,000 acres. Although a modern project, it was remarkable that practically no canal-lining was used, although losses have been considerable in some places, but have been reduced by the sealing action of the (frequently) muddy water. The Project is still being directly operated by the Bureau, and the Water Master was proud of the fact that, in spite of the length of the canals, he could meet "change of water orders" at 24 hours' notice, though he could require 72 hours' notice to be given.

During my tour I was shown a "Gradall" machine for cleaning canals, and also a number of the canal structures, including the "double gate" method of measurement. At one point the main canal is taken in a tunnel under the town.

Later in the afternoon Mr. Lyman took me out some 30 miles to see the Conchas Dam, a concrete overflow structure about 180 feet high, with earthen flank embankments totalling over three miles.

In the evening I caught a plane to Albuquerque.

**El Paso, Texas** (August 6th and 7th). On the 6th (a Sunday) I flew to El Paso from Albuquerque. On the 7th I called at the Project Office of the Bureau of Reclamation, and an Engineer of the staff was deputed to take me on a tour of the Project.

The Project consists of a series of dams, weirs and canals on the Rio Grande, extending into two States (New Mexico and Texas) and also involving international arrangements with Mexico. The Project had its beginnings over 200 years ago, when the

Spanish pioneers operated there, and it has developed now into a total irrigated area of some 173,000 acres.

Water is derived from the Elephant Butte Dam (pronounced "Bute"), built in 1916, and the Cavallo Dam (pronounced "Ca-vie-o"), built in recent years. Both dams were low at the time of my visit, after a poor winter's snowfall. The Rio Grande has become no more than a large canal, being controlled by the dams and confined by levees.

This is almost a "one-crop" project, about 70 per cent. of the area being under cotton, which is very profitable at present "support" prices. Lucerne (20 per cent.) and truck crops make up the balance of the area. Cotton yields an average of 1,000 lb. of lint (2 bales) per acre—a gross return of some 400 dollars per acre. The average size of the farms is 100 to 160 acres. Water rates were stated to average £2 11s. 6d. per acre. Cotton takes three acre-feet, and lucerne about four.

Mexican labour is employed generally, but is getting scarce. "Wet-backs," or illegal immigrant labourers, cause trouble to the immigration authorities, but find ready employment. Wages are 50 cents (3s. 6d.) per hour, and up.

I obtained some interesting literature on farm costs and incomes, relating to water charges and land units.

Drainage of the Rio Grande Project is accomplished by open drains, 10 or 12 feet deep, and spaced from a quarter mile to one mile apart.

They appeared to be operating successfully in these alluvial soils, but, like all open drains, present a problem in maintenance.

I saw an interesting machine cleaning weeds and mud from the canals. It spans the canal, running on caterpillar tracks, and it operates a chain of buckets, spilling on one side. It has to be reversed to clean the other side. This particular machine was 25 years old.

I saw no lined canals on this Project.

**Phoenix, Arizona** (9th August). On arrival from Tucson in the morning, I was met by a member of the Bureau of Reclamation staff, who took me on a tour of the Salt River Project.

Parts of this Project, which embraces 227,000 acres, suffer from a saline water and a saline soil subject to water-logging, and in many parts only certain crops, such as lucerne and barley, can be grown, but nevertheless they are being grown, and profitably grown. I saw lands being reclaimed. First, the clearing, levelling and "bordering." Then leaching with heavy waterings for about six months. Then a grain crop (barley) for a season. Then lucerne, sown in a stand of Bermuda grass which enables the lucerne to germinate. After the lucerne crop it is often possible to grow normal rotations.

Over a large area, water was once standing on the surface or only a couple of feet below it. (It still is, in some places.) Open drains were constructed but soon became ineffective. The only effective solution has been deep pumping. Boreholes 20 inches in diameter have been sunk in large numbers (often only a quarter mile apart) and give yields up to eight cusecs. This water is highly saline (up to 5,000 p.p.m.), but it nevertheless is used after dilution with the canal water, which itself is about half as saline. (On alkaline lands, heavy waterings are used, up to eight acre-feet per acre, and it makes little difference how saline the water is, provided that it can get down.) The result of this heavy pumping has been to lower the local water table by 50 feet or so, and to enable thousands of acres to be used.

Nevertheless, the high salinity and the threat of water shortage is creating an increasingly serious problem, and the area is looking forward to receiving fresh water from the Colorado, through a projected pumping and canal scheme.

Lucerne yields of five to six tons, and barley yields of about 30 bushels, are obtained. Hay crops, vegetables and grain sorghums are largely grown. The feeding of livestock is a very important industry.

There are many good citrus orchards and date gardens. Dates may be of interest in the Sabi, as they produce a very high return of food per acre, but the rainfall in the Sabi may be too heavy. Palms are planted about 30 feet spacing each way, and will often yield 200 to 300 pounds of dates per palm. Some of the varieties grown here and in California are the Deglet Noor, Halawi, Khadrawi, Hayani, Maktoom, Medjool and Bahri. Dates require hand labour for pollinating, trimming leaves, thinning the fruit, and picking (often using ladders). I saw the process of fumigating, drying and storing the dates after picking.

**Yuma, Arizona** (10th August). I had a discussion of the Sabi Scheme with Dr. Converse and some of his colleagues, and then visited the Experimental Station and the Projects.

There are two Projects, one in the "Valley" and one on the "Mesa" (pronounced "May-sa"). The Valley Project is an old one, and farming is carried on intensively on fertile soil, but which suffers from a high water table. Open drains are used, and water is pumped back to the canals. Crops are of the general type, with a large acreage of vegetables, and some citrus, vines and dates. The word "mesa" is properly applied to a table-land (flat-topped hills), but is here used for a great bench or terrace of soil some 30 feet above the Valley level. This soil is of a very open textured sandy type, and consumes excessive amounts of water, up to 15 acre-feet per acre. The early settlers, who received Colorado water by canal benefited by the deposition of a foot or more of silt, but the Boulder Dam now traps the silt, and the water going on to the land is clear. Citrus and vines (the latter now of a nematode-resistant type) are extensively grown, and there is also general crop farming. Holdings on the Mesa are often small, 10 or 20 acres (of citrus).

Dr. Converse then drove me a considerable distance up the Gila Valley (guttural "G"), where extreme shortage of water and excessive salinity are telling their tale, and few farms are left. Water is pumped from deep wells, and often contains as much as 7,000 parts of salt per million. I met one of the few successful farmers, who comes out by growing lucerne for seed. An interesting point here is the importance of bees in pollinating the blossoms, and although opinions differ, it is held that bees can make the difference between a yield of 150 lb. and 600 lb. of seed per acre. Bee-farmers co-operate with lucerne seed-growers.

A large Project is under construction to supply the Gila Valley with water pumped from the Colorado (salinity 700 p.p.m.).

**Imperial Valley, California** (11th-13th August). The Imperial Valley is the area south of the Salton Sea, and runs from slightly above sea level to 240 feet below. The area surrounding the Salton Sea is extremely interesting. It was once a part of the Gulf of California (a high water mark is clearly to be seen on the hill sides, but differs slightly from present sea level), but was cut off by the delta of the Colorado, and was later a fresh-water lake. It had dried up, however, when settlement started, until floods breached the banks of the precariously-poised Colorado at the point where the old canals took off, and the waters of the Colorado poured down into the Salton Sea, creating two river channels and the present sea, which is 30 miles long by 10 miles wide. The breaches were repaired, largely by the Southern Pacific Railroad, and since then the Colorado has been tamed by the series of dams starting with Boulder Dam, and almost completely diverted into the All-American Canal. Yuma was once a sea-port, but is now inaccessible to boats, as there is practically no water left in the river below it.

The Valley comprises about 500,000 acres of irrigated lands, administered by the Imperial Valley Irrigation District, which contracts with the Bureau of Reclamation for water supplied through the All-American Canal. The Valley is highly productive, growing rich crops of lucerne and sugar-beet, and very large acreages of vegetable and truck-crops, of which lettuce and cantaloupe are the most important, lettuce especially so.

The total value of production in 1949 was over 92 million dollars (£32,000,000). The average size of the farms is just over 100 acres each.

Vegetable growing concerns usually lease land for one or two seasons, and will normally insist on its having been under lucerne for at least three years. The feeding of cattle is done on a large scale, usually by big operators, who own the cattle and stall-feed them in yards with feed grown or purchased locally. It gave one an insight into what could be done through the growing of lucerne on a large scale in the Sabi Valley, not only to improve the beef produced by the present ranches but also to bring about an improvement in the quality of the breeds which could be ranched if lucerne was available through the winter.

The soils of the valley are of the heavy types, including "Imperial Clay," and water-logging is an ever-present danger.

I spent an afternoon at the Soil Conservation Service office, where I was told of the excellent results which had been obtained with tile-draining. Over 100,000 acres have been "tiled," so successfully that last year for the first time more salts were removed from the entire Valley than entered it. I obtained particulars of the technique that is used. A rotary trenching machine is employed, which digs the trench (about six feet deep) and draws through it a "shoe" or shield within which the tile-layer works.

Hoppers in the "shoe" supply gravel below and above the tiles, and a strip of "malthoid" is drawn over the tile. A bull-dozer follows the machine and back-fills the trench as they go along. Contractors undertake the complete job at all-in charges varying from 30 cents (2s. 2d.) per foot for 4-inch tile to 40 cents (2s. 10d.) for 8-inch tile, or about 60 to 85 dollars per acre for 6-inch tile. Concrete pipes are used. Special attention must be paid to settling the backfill and to the outlets. The trenching machine is made by the Buckeye Co. of Ohio, and by other firms, including a local firm (J. L. McElvany, Box 261, El Centro), which also makes the "shoe" for attachment to standard trenching machines.

I should have mentioned earlier that I was met at El Centro by Mr. E. G. Noble, of the Brawley Experiment Station, a man with 35 years' experience of Yuma and the Imperial Valley. He took me to the County Commissioner and the County Agricultural Agent, and to the Irrigation District Offices. Here I was told something of the history of irrigation in the Imperial Valley. At present the charges for water made by the District amount to an "operation and maintenance" charge of about 6.00 dollars for four acre-feet, plus an annual assessment of five to six dollars per acre for capital repayment, based on a rate of 3.50 dollars per 100 dollars valuation. The District maintains an efficient "operation and maintenance" organisation, and can make "changes of water" orders effective at 24 hours' notice. Water orders are collected daily by ditch-riders (often by notes clipped to gates) and by telephone and other channels, centralised at the Head Office and relayed to Imperial Dam over 80 miles away, where the inflow to the All-American Canal is regulated by the Bureau of Reclamation.

Mr. Noble motored me to the Imperial Dam, which is a large diversion work. Water leaves the Dam in four interconnected canals, three of which are switched into the De-silting Works, which cover 80 acres, and consist of six large basins, in which the sand settles, is kept moving by a series of slowly-rotating agitators and is sluiced from under back to the river. The clear water overflows the side weirs of the Basins into the Canal proper. The fourth canal mentioned above is a by-pass. The Canal at the time of my visit was carrying 11,000 cusecs, and is designed for about 15,000. Apart from its size, the Canal is also remarkable for being unlined, although it passes through "Mesa" formations. One section passes through huge sand dunes, which however lie above the "mesa" formation.

Imperial Valley is of course intensely hot. The rainfall averages 3 inches per annum, and rain is considered a nuisance.

Houses in this part of the States are universally equipped with "coolers," usually of a type reminiscent of the "Charcoal safe" employing the evaporation principle, and fitted with a powerful "squirrel cage" fan, which draws air through the cooling panels (filled with a type of wood wool) and blows it into the house, being usually fixed to a window. These devices could readily be manufactured at small cost in Rhodesia, and should be attached to houses in the Sabi Valley and other places where the heat is not accompanied by humid conditions. Under humid conditions it is necessary to use an expensive "air-conditioning" plant.

**Coachella Valley** (14th August). Mr. Noble motored me to Indio in the Coachella Valley. This valley is the counterpart of the Imperial Valley, but lies north of the Salton Sea. It is in process of being supplied with water by means of the Coachella Canal, a branch of the All-American Canal. The present acreage under irrigation is 30,000 acres, which is being expanded to 78,000 acres.

The value of raw irrigable land is from 100 to 300 dollars per acre. The main Canal is concrete lined, and is protected against being damaged by run-off from the hills to the east by means of an enormous dyke or embankment, with occasional floodways across the Canal. Distribution is by means of pressure pipes, including one eight feet in diameter across the Valley.

The most interesting feature of the visit to Coachella was the extremely good work that is being done to measure and record underground water levels prior to, and during, the development of irrigation. This work is being done by the Bureau of Reclamation in collaboration with the Department of Agriculture staff at the Salinity Laboratory at Riverside. It consists of sinking 2-inch cored holes on a 2-mile grid, and "jetted" holes (called "piesometer wells") at intermediate spacing not more than one mile apart and frequently less. The piesometer wells can be put down cheaply by a special machine, to depths of 50 or 60 feet, through the soil and sub-soil. With practice, the operator can log the formations encountered (clay or sand, etc.) by the feel of the machine. The holes are lined with ⅜-inch pipes. The process will be described in a bulletin to be published shortly, and I asked for a copy to be sent.

Careful records are kept, and maintained, of the water levels in all holes, and in this way the initial level of the underground water, and its subsequent behaviour, can be closely mapped. Any danger spots are immediately apparent, and can be dealt with. One such area of 400 acres had been tile-drained, resulting in the removal of a flow of 400 gallons per minute.

This careful, but not costly, work appealed very greatly to me as the rational approach to the problem of drainage. It is far better than anything I encountered elsewhere.

**San Joaquin Valley** (18th August). On the morning of the 18th we visited Mr. George Harrison, of the Shafter Experimental Station. He has done a remarkable job of cotton breeding, and his new strain 442, which is now compulsory for California, has some excellent qualities, among which is its remarkably high tensile strength, over 90,000 lbs. per square inch. Cotton is extensively grown in parts of the San Joaquin Valley, usually three or four crops following lucerne, and with interim crops of potatoes and sugar-beet. He described something of the technique of the deep wells which supply most of the water, depths down to 2,000 feet, but usually about 600 feet, diameter 14 inches, yields 500 to 3,000 gallons per minute. Water levels have, as is well known, dropped very seriously in the San Joaquin Valley. At Shafter a drop of 80 feet has occurred in the last three years.

Commenting on the danger to cotton of stainer beetles in the Sabi Valley, he said that, while that particular pest was not known in America, he felt that it should be susceptible to control by modern insecticides, applied by aeroplane, as is so commonly done in California. He confirmed the opinion that I had previously obtained, that cotton could not be successfully matured as a winter crop in the Sabi Valley, in the light of the recorded temperatures. Mr. Harrison showed me the very excellent instruments being used for testing the cotton fibres, two made by the University of Tennessee and one by a manufacturer at Tucson.

Land values (under irrigation) near Shafter are as high as 1,350 dollars (£500) per acre, and water often costs as much as 50 dollars (£18) per acre per annum.

In the afternoon we visited the Tulare Lake area, a remarkable region, originally a lake, but in the last century dried up by the diversion of the rivers feeding it. On several occasions, however, heavy floods have filled the "lake" again, submerging as much as 100,000 acres to a depth of 15 or 20 feet. In between floods, this huge flat area of heavy black clay soil is farmed by large operators, such as the J. G. Boswell Company. Cotton is the chief crop. To reduce the salt menace, the water is kept low in the canals, and is pumped by huge portable units into the field furrows. Everything is on a large scale. In some areas, one man on a bull-dozer acts as an irrigator, turning on the water by "dozing" down the bank of the furrow! East of the lake area, on the higher land, I saw some of the Company's wells, 1,800 feet deep, and delivering as much as six cusecs each. One was equipped with a 200 h.p. motor. The water table hereabouts has apparently dropped about 140 feet in the last 30 years. The "Friant-Kern" Canal, under construction, is intended to relieve the position.

The Company's engineer told me that water cost them an average of six dollars (42s.) per acre-foot (water is partly from the rivers and partly from wells). Cotton required 2.5 acre-feet, and barley 1.0 acre-feet (the latter applied in one watering).

On the 19th I flew from Bakersfield to Berkeley (San Francisco), and had a good opportunity of seeing the intensive cultivation carried out under irrigation in the San Joaquin Valley. The Valley is flat, 50 miles wide, and 250 miles long—only a portion of this great area is irrigated, and the rest is barren desert.

**Sacramento Area** (22nd August). Mr. Gardner motored me to this area, in the southern part of the Sacramento Valley, which is the northern part of the "Central Valley" of California.

At Davis, near Sacramento, I called at the University of California College of Agriculture, and spent some time with Dr. Veihmeyer, who is a world authority on the soil-water-plant relationship. He has done an immense amount of work on this subject, and presented me with a great deal of literature. He strongly emphasised two points—"do not disturb the soil by over-cultivation; leave it alone as much as possible; do not sub-soil it"; and "farmers use too much water."

I was anxious to get information on the rice-growing which is extensively practised near Sacramento, but was unable to see Mr. Davis, the University expert. However, Mr. Gardner and I sought out some large rice-fields and examined them.

In California, unlike the East, rice-growing requires practically no hand labour. Contour banks ("checks") are put up at vertical intervals of two or three inches, and are most irregular in shape, as is well shown in my aerial photographs. The lands are then most meticulously levelled by tractor and "land-plane," the latter being on the principle of a road-grader but 60 feet long. Small weirs are installed in the checks to control the water level, and to enable surplus water to proceed from one field to the next. The lands are then flooded to a shallow but uniform depth, and are seeded by aeroplane. They are then kept flooded, no hand labour being employed. They are drained of water in due course, and when the land is dry enough the crop is reaped by a special "combine." The area used for rice-growing in the Sacramento Valley consists chiefly of the "sloughs" or flood channels which were occupied by the river before it was confined by dykes. They are of an impervious nature. Rice is principally grown by large landowners or corporations.

**Columbia Basin**—Washington State—(23rd, 24th 25th and 26th August). On the afternoon of the 23rd I proceeded by air from Sacramento to Yakima, in the Columbia Basin. On the way I had a good view of the Shasta Dam, at the head of the Sacramento Valley.

I was met in the evening at Yakima, and motored some 50 miles to Prosser, in the Yakima Valley (the Yakima River is a tributary of the Columbia).

The Agricultural Station at Prosser is jointly staffed by the B.P.I.S.A.E., the State College and the Soil Conservation Service. Members of the staff also conduct research on the "development farms" which have been set up elsewhere in the Columbia Basin. Mr. Singleton, of B.P.I.S.A.E., is in charge of the Station, and he proved most helpful to me. I met several members of the staff, and particularly Dr. Viets, who works on plant nutrition and soils, and who conducted me over the Prosser Station.

The Basin consists of largely undulating land, much of the soil being wind-blown, or derived from lava flows. The corrugation method of irrigation and sprinklers are both used.

The standard five-year rotation is: three years lucerne (seeded with spring wheat), one year potatoes and one year maize or sugar-beet. With a seven-year rotation there would be an additional year of lucerne, and sugar-beet as well as maize.

I spent some time with Mr. Mech, of the Soil Conservation Service, who was carrying out some very interesting experiments. The land was divided into two plots; the corrugations in the one were steep (7%) and in the other much flatter (2%). Crops in the standard rotation were grown on the plots, and careful measurements made of the varying amounts of water applied, of the surplus water and silt loss. The different rates of application of water were based on certain percentages of the "available" soil moisture, which was measured by sampling and direct analysis. Mr. Mech gave me literature on the subject.

One of his main conclusions was that by watering at less frequent intervals both water and labour were saved, with no reduction in yield. I told Mr. Mech that I was glad to have his figures, but that I was not surprised at his results, which were in accordance with our own opinion! Mr. Mech employed a sampling tube of ¾-inch pipe, with the lower end expanded and then reduced at the tip. A "hammer" was used for driving the tube in. I was impressed with the very careful way in which this experiment was being conducted.

On the 25th, Mr. Singleton and Dr. Viets motored me to two of the "development farms" in the Columbia Basin.

There are several types of development farm in use by the Bureau of Reclamation, and I obtained literature comparing the merits of each type, but most people I saw agreed that the Columbia Basin type was the best.

The basic idea is to have a specimen farm operated by a farmer, and not by a Government Agency. The psychological advantages are obvious.

Briefly, the Bureau selects a typical farm, lays it out for irrigation and even plants crops such as lucerne, puts up the necessary buildings (including a cottage for visiting officials), provides domestic water (a great problem in the Basin), and supplies the necessary implements. A suitable farmer is then carefully selected, and offered the farm on lease, subject to certain conditions, of which I have particulars. He is guaranteed a basic income, and 60 per cent. of the net profit beyond that income. He is required to give facilities for research, and to allow members of the public to see over the farm.

The scheme appears to be most successful. The idea is to start it some years before water will be supplied to the area, so that the results obtained will be available to new settlers. I discussed the scheme with the two tenant farmers I met, and found them well satisfied with the arrangement.

The Pasco Development Farm, which I visited, is 40 acres in extent, and the crops grown are sweet corn, potatoes, maize, lucerne, sugar-beet, and beans. About six dairy cows are kept. Water is supplied at a charge of four dollars for 3½ acre-feet, any additional water being charged on a sliding scale, at a sharply increasing rate. The farmer agreed that 3½ acre-feet was "about right." Agriculture is, of course, not possible in the winter. Some zinc deficiency experiments were in progress.

The Moses Lake Development Farm is 80 acres, and the same crops are grown. The farm was larger as the soil was poorer. The soil was only about 18 inches deep, overlying gravel and cobbles, and appeared to be of a porous type, but actually was most impervious and had given a great deal of trouble in attempting to get any penetration of water.

We proceeded northwards to Ephrata, where Mr. Singleton handed me over to the Bureau of Reclamation people. Ephrata is the centre of the development of the Columbia Basin Project. This is a project to irrigate over 1,000,000 acres, by means of water pumped from the Grand Coulee Dam. The water is collected in the "Equalising Reservoir," 27 miles long, formed by building two dams across the valley known as the Grand Coulee and then led into a system of huge concrete-lined canals spreading both to the east and the west.

The million acres of irrigable land have been selected out of about 2½ million acres available.

The development of the million acres of irrigation is planned on a schedule providing for about 70,000 acres to be brought under irrigation each year. Even the Bureau of Reclamation, which is used to large projects, is somewhat worried about such a rate of development!

They have, however, in this project profited from earlier mistakes, and have made a most exhaustive study of the soils, extending over some 13 years. Mr. W. W. Johnston, who has been in charge of all this preliminary work, arranged for me to be given a considerable amount of literature, which should be of the greatest value in planning the development of the Sabi Valley.

The work in the Columbia Basin is closely shared by a number of Federal and State agencies, and is the outstanding example of co-operation between, and co-ordination of, these several agencies.

During the late afternoon I was taken out to see something of the engineering construction work, and was fortunate enough to see the process of concrete-lining the West Main Canal. I also saw the Soap Lake Siphon, which is 25 feet in diameter and two miles long, and the Bifurcation Works, where the East Canal takes off.

On the 26th I was motored up the Grand Coulee, and saw the Equalising Reservoir under construction. Arriving at the Grand Coulee Dam, I was given a guide, who showed me over the Dam in general, and in particular the installation of the remaining turbine-generator units and the 12 enormous pumping units.

In the evening I took a bus to Spokane.

**Boise, Idaho** (27th, 28th and 29th August). I proceeded to Boise (pronounced "Boy-see") by air on the 27th, a Sunday.

On the 28th I met Mr. Nelson, Regional Director of the Bureau of Reclamation, and some of his staff. After some discussion of our problems, I was taken out for the day to see irrigation developments in the Boise area.

In this area the Snake River and several large tributaries converge, and are utilised to irrigate something over 600,000 acres. The area is organised into a number of Irrigation Districts. The farms are from 40 to 60 or 70 acres, and I was impressed with their prosperous appearance. I saw more evidence of livestock farming than in most other areas. It is a mixed farming area, with dairying, pigs and poultry. Agriculture consists of hay crops, pasture, sugar-beet, maize, potatoes, vegetables, and a great deal of seed growing (sweet corn, vegetables and flowers). Hops are grown in some parts. The feeding of steers is a profitable industry. I saw yards where silos were filled by tip trucks and consolidated by D/2 tractors. In the feeding yards, the troughs are filled by trucks with feeding devices on the sides. Cattle are fed hay and grain. Sugar-beet farmers have the first call on their pulp, which they use for feeding their own stock. Manure is important for beet growing. The beet crop here averages 20 tons per acre. Potatoes are a highly seasonal crop, grown to catch a particular market. I inspected a co-operative concern, where potatoes were being graded and shipped.

A common rotation is: grain plus lucerne (first year), lucerne (three years), potatoes, sugar-beet.

In many of the areas, particularly new areas, there is a saline problem, taking the form of "slick spots." These show up clearly in the crops, but appear to diminish with good farming practice in a few years. The most effective treatment is gypsum. Manure is also good, but is less permanent.

There is a general drainage problem, in the valleys and near the rivers. Open drains are used, and I saw some under construction, excavators being employed. I had a talk on drainage with the Manager of the Gem Irrigation District, who had had much experience. The depth of open drains was a minimum of 14 feet, and a maximum of 25 feet. The minimum gradient used was 1 in 500. I saw a large number of these drains, often less than half a mile apart.

Labour is an expensive item in Idaho, being about 7s. per hour, both for Mexicans and local labour.

Charges for water in the Boise area are on a "per acre" basis, and not per acre-foot. This was apparently because some land requires more water than others.

On the morning of the 29th, I called at the Soil Conservation Office in Boise, where I had a discussion and received some literature. The officers considered that our "doubtful" land should improve with irrigation, provided that over-irrigation was avoided and drainage was established. They pointed out that the salt concentration on the Sabi soils is greater at lower soil levels than at the surface, which they considered unusually favourable. They showed me the results of farming valley bottom land, which in 1925 was full of "slick spots," and which in 1932 and 1950 had greatly improved. The only treatment it had received was an application of gypsum in 1926.

In the afternoon I was taken to see the Arrowrock Dam, a 200-foot dam built in 1915.

**Salt Lake City and Logan, Utah** (30th and 31st August, 1st September). Arriving at Salt Lake City by air, I called at the Regional Office of the Bureau of Reclamation, and spent some time discussing the Sabi Project with members of the staff, who were impressed with its prospects.

I took a bus to Logan, some 60 miles north, and saw Dr. Walker, Dean of Agriculture at the Utah State College.

Later that afternoon I accompanied Dr. G. D. Clyde, who is head of the Research Branch of the Soil Conservation Service, on a tour of the irrigated areas as far as Ogden. These are some of the oldest irrigated areas in the United States, having been pioneered by the original party of Mormons, and are apparently very prosperous, the main crops grown being sugar-beet, lucerne, maize and side crops such as tomatoes.

Some areas, however, are badly water-logged, and the Weber Valley Project is being planned to drain, reclaim and supply new water for 70,000 acres now water-logged, and to supply additional water for 30,000 acres now being farmed.

On the 31st August I went over an extremely interesting experimental project at Logan, the most ambitious and complete that I had seen. The joint "project leaders" are Dr. Hansen (Soil Conservation Service), Dr. Haddock (B.P.I.S.A.E.), and Dr. Taylor (Utah State College). The experiment covers only 12 acres, but it includes a rotation trial of five crops, in four replications, with two methods of water application (surface and sprinkler), four "moisture levels," and two fertilisers combined in 32 different ways. I obtained a diagram showing the lay-out. Moisture levels are measured by tensiometers and gypsum blocks. Water applications (in surface irrigation) are measured by using horizontal pipes with small openings, the discharge of which had been calibrated. Surplus water was measured by small Parshall flumes. Field observations were noted on printed cards, which were punched, and analysed, largely by machine, in the laboratory. The whole experiment impressed one with its attention to detail and the methods used to reduce labour.

For all that, the staff employed consisted (in the field) of the three project leaders, four students (equivalent to our technical assistants), and one farm foreman, and, in the laboratory, of a full-time chemist, three part-time students, a full-time woman secretary and a part-time secretary. The services of an agricultural statistician would be required to analyse the extremely complicated results from time to time.

I had discussions with two other members of the staff, and went out with Dr. Lauritzen, of the Engineering Faculty, to see his experiments with canal linings. He had tried out various soil, stabilised soil and covered bituminous linings, but was convinced that concrete was the most satisfactory and efficient.

## PART II.

## TECHNIQUES AND CROPS.

In this section of the report I deal with specific points, at the risk of repeating some of the references in the Narrative Report.

### SECTION A.—TECHNIQUES.

1. **Soil Survey.**—I cannot over-emphasise the importance of soil survey. In the early days the Americans made tragic and costly mistakes in applying water indiscriminately to what appeared suitable land wherever it was physically possible to do so. They have learnt a costly lesson. It is now an indispensable

preliminary to any project that the soils should be completely mapped, tested and classified, all unsuitable soil being rejected.

To this end they have developed an excellent soil survey technique, which is applied and interpreted with the close co-operation of the various agencies concerned. Some details are given in the Narrative Report.

2. **Drainage.**—In irrigation projects, drains are as important as canals. The principal methods practised in the States are open drains, tile drains and "wells" (boreholes). Each method is applicable to particular conditions, and it will be a matter of experiment to determine which is the best for any given area.

The most rational attack on the drainage problem that I saw was the work in the Coachella Valley.

As a close corollary to the question of drainage there is the question of lining canals.

3. **Plant Breeding.**—Although no one specifically drew my attention to this, I could not help being struck by the amazing benefits the Americans have reaped as the result of plant breeding. One does not see straggly, uneven crops; one sees solid, uniform stands of vigorous plants, which produce extraordinarily high yields. The high quality of the food generally in the States is another testimony to plant breeding.

The breeding of resistant strains has been one of the most effective weapons against plant diseases.

4. **Fertilisers.**—With the traditional American aim of efficiency, there is great emphasis on using the maximum amount of fertiliser that will produce an economic return. I saw some amazing figures of maize yields under irrigation obtained on one of the Columbia Basin development farms. The average yield of 30 to 40 bushels (say 9 to 13 bags) had been increased to over 180 bushels (about 54 bags), by increasing the application of both nitrogen and water.

5. **Lining of Canals.**—Most of the older projects operate with unlined canals. This trend has been reversed, however, in the newer projects, as it has been realised that, apart from saving water, a lined canal reduces water-logging, drainage and salinity problems enormously, as well as maintenance costs. Many unlined canals that I saw are paralleled by a drainage ditch. It was admitted to me that many of the unlined canals would be lined if it were feasible to do so, and that the time would come when many of them would be lined, particularly in States that are short of water, such as California and Azizona.

6. **Duty of Water.**—This was a point on which I found the greatest difficulty in obtaining any accurate practical information, although I obtained literature giving experimental results. The reason for this is probably the fact that none of the Government agencies, such as the Bureau of Reclamation, deal directly with this matter. The various Irrigation District officials also were somewhat vague. Such figures as were given to me are quoted in the Narrative Report. Other information is contained in literature which I obtained.

7. **Preparation of Land.**—As pointed out earlier, great pains are taken in American projects to prepare the land correctly for irrigation. By spending time and money on the initial preparation of the land it is possible to irrigate with a minimum of labour, and this has obviously been found to pay. The degree of preparation depends on the type of land, the crops to be grown and the method of irrigation. In every case, the minor irregularities, high points and depressions, are levelled off. On "flat" land, the usual method is to lay out the fields with "borders." Certain crops, such as rice, require the most meticulous levelling, but this is done on very flat land. I saw little or no "bench terracing" on undulating land, where the usual method is the "corrugation" method (small furrows on a slight gradient), but sprinkler systems are used also to a minor extent on such land.

As an example of the cost of the preparation of land, I was told by the Bureau of Reclamation at Yuma that the Bureau charged 150 dollars (£54) per acre for clearing, levelling, ploughing, laying out for irrigation and the necessary small structures. This land was flat, and covered only with "Karroo bush" and small scrub (mesquite).

8. **Methods of Irrigation.**—As mentioned above, the commonest methods are borders or basins, and the furrow or corrugation systems. The latter, of course, are mainly applicable to row crops, but the corrugation system is often used, for example, when irrigating lucerne between borders, in order to secure better distribution and penetration of water. With the furrow and corrugation systems, there is an increasing tendency for the more progressive farmers to use "siphon tubes" to lead water to the furrows or corrugations rather than to cut the furrow banks, as is so often seen here. The tubes are 1½-inch or 2-inch diameter, about 4 feet long, curved to the proper shape, and made of aluminium, plastic or rubber, the aluminium being the best.

I also saw a considerable amount of "sub" irrigation, where water is laid on under pressure in concrete pipes. A large "riser," or vertical concrete cylinder, at the head of each field, provides local control of the head, and houses the sluice valves. Water is brought to the surface at close intervals through various types of valves, ranging from ¾-inch cocks to circular valves 8-inch to 10-inch diameter, such as the "alfalfa gate." The advantages of "sub" irrigation are saving in maintenance, saving in labour, and freedom from algae and weed growth. It is particularly suited to porous, undulating land, and is often used for citrus.

Sprinkler systems are not extensively used as yet in the West. They are mostly of the "rain-bird" type, employing aluminium pipes (6-inch stationary lines and 4-inch or 3-inch movable lines). One type I saw was supported on large wheels, the pipe forming the axis, but it seemed awkward and the jets tended to catch in the crops as they rotated.

9. **Soil Moisture Measurements.**—The "consumptive use" of water is based on these measurements, which are used in all experimental work. The determinations are made either by direct sampling and analysis, or by the use of devices for reading off the "moisture tension" and hence the moisture content.

The two pieces of apparatus used are the gypsum (plaster of paris) block and the tensiometer. I obtained literature on these devices.

Experiments on the consumptive use of water are based on maintaining the soil moistures above certain percentages of the "available moisture."

10. **Land Clearing.**—This is a simple matter in the Western States, as they have nothing more than light brush to cope with. In other parts of the U.S.A., however, there has been experience of heavy clearing, with little or no hand labour available, and it was suggested to me that the machine clearing of large trees was unduly expensive, and that they might be left, after ring-barking or burning, and removed at such times as labour was available.

11. **Economy in Labour.**—It is common knowledge, of course, that the Americans are expert at labour-saving methods, but it is very instructive to see how good organisation and mechanisation can reduce hand labour practically to zero. There is very little improvisation; machines and buildings, etc., are designed for the particular purpose for which they are used, all with the object of saving labour. There is a great tendency to leave specialised operations (e.g., baling lucerne, spraying crops and tile draining) to specialist contractors. Farmers are, however, mostly equipped with the implements they actually use, and frequently spend more on implements than on the farm itself. In such circumstances a farmer can carry out practically all his farming operations single-handed, so much so that agricultural advisers often complained that they found it difficult to persuade the farmer to leave his tractor-seat to do anything else!

12. **Canal Seepage Losses.**—I came across two interesting pieces of experimentation. One was by Dr. Rohwer, of the Soil Conservation Service, who was measuring the penetration of water into soils with an apparatus consisting of two concentric rings, 6 and 18 feet diameter, kept full of water to a uniform depth. His work has not yet been published.

I also saw a very interesting apparatus developed at Logan and Riverside for measuring the penetration of water through a small area in the side or bottom of a canal actually in service. I obtained literature on this work.

13. **Use of Aeroplanes.**—Aeroplanes are being increasingly used for such operations as spraying or dusting crops, seeding and fertilising lands. The planes were of the light, slow biplane type. Helicopters, which are more expensive, are used to a lesser extent.

14. **House Coolers.**—I have referred elsewhere to the simple device used for cooling houses and other buildings in the hottest part of the States. Without it, the living conditions in the summer would hardly be tolerable. It is such a simple and cheap attachment, compared with the cost of a house, that I consider that it would be well worth while using it on all houses put up in the Sabi Valley, and for that matter in any other hot, dry parts of the country. The only supplies required are water and electric power. The apparatus is simple and could readily be manufactured in the Colony.

## SECTION B.—CROPS.

15. **Lucerne.**—This is the universal crop and the foundation of every irrigation project. It is grown in all climates, from the coldest northern States, which have a short growing season but long summer days, to the hottest desert regions of the south-west. It is the universal soil-builder, and scientists admitted to me that lucerne produced benefits for which their present knowledge could not fully account. For this reason it is an essential item in any rotation.

It is most commonly sold or consumed as hay, and the amount of hay that is stored for the winter would be an object lesson to many Rhodesian farmers. It is also sold to de-hydration concerns, for poultry and dairy feed. To some extent it is grazed in the field, by sheep or dairy stock, but grazing must be moderate to avoid crop damage, and there is a danger of "bloat."

It is usually grown for three or four years, but sometimes as long as six years. In the colder climates only three cuttings are taken each year, but in the south as many as seven. It is often seeded with a grain crop such as wheat or oats.

The water requirement was stated to be 3½ to 4 acre-feet in a 12-month season. Put in another way, each ton of cured hay requires at least 750 tons of water, or about seven inches of water per acre (including "useful rainfall").

The varieties used in the South-West were stated to be those known as Chilean, Indian, African and the Hairy Peruvian.

In parts of the South-West the growing of seed, for sale locally or for the Northern market, is a profitable undertaking.

There is no doubt in my mind from what I saw that the growing of large acreages of lucerne in the Sabi Valley could revolutionise the cattle ranching industry in the Low Veld, not only by increasing the yield and quality of beef obtainable from existing herds, but by making it possible to utilise better breeds than is the case at present. Dairying and sheep raising would benefit in much the same way.

16. **Maize.**—This is one of the main crops grown under irrigation in the Western States. Thanks to the introduction of suitable hybrids, and to the relatively heavy but economic use of fertilisers, and good farming practices, heavy yields are obtained. All the maize I saw was closely planted, three feet between rows and 9 inches to 12 inches in the row. Close planting gave a clean crop and better yields.

17. **Barley.**—This is extensively grown in the Western States, to the virtual exclusion of oats. In some places it was grown with as little as 12 inches of water. Most of the barley I saw was grown for malting purposes.

18. **Sorghums.**—This is an irrigated crop which has made great progress through successful plant breeding. A double-dwarf variety that I saw grows to a height of only about three feet, and carries a phenomenal crop of heads. It is suitable for "combining." Sorghum yields average about 40 bushels but go

as high as 120 bushels, and generally are higher than maize. This is a crop which should be of great value under Rhodesian conditions. Water requirements are given as about 18 inches.

19. **Cotton.**—This is, of course, confined to the hotter regions in the South, and is one of the biggest money-makers at present. The water requirement was given as 2½ to 3 acre-feet per acre. Yields vary from about 1,000 lbs. to as high as 2,000 lbs. of lint per acre.

The growing is highly mechanised, and cotton-picking machines are being increasingly used. To facilitate machine-picking, aeroplanes are used to apply a "de-foliant" to the plants when the crop is mature, causing the leaves to fall off, and leaving nothing but bare stems and bolls for the machine to operate on. Insecticides are also applied by aeroplane.

The suggestion in the Alexander Gibb Report that cotton should be tried as a winter crop in the Sabi Valley, in order to avoid stainer beetle attacks, was not supported in the States, as it was considered that the winter temperatures were too low to produce an economic crop or any crop at all.

One of the interesting machines I saw was a "tractor on stilts," high enough to clear a crop four to five feet tall; at Shafter it was used to pull a high-mounted trailer for spraying cotton. All wheels were fitted with curved guards to prevent damage to the crop.

20. **Wheat.**—This is an important crop for the Sabi Valley, but as it is not grown under irrigation in the States I was not able to obtain much useful information.

In discussing wheat with Dr. Bayles at Beltsville, however, he suggested that there were certain rust-resistant wheats that might be tried here as summer crops, such as "Baart 38," "White Federation 38," and "Coastal." He also mentioned that the Mexican variety "Supremo" could be grown in either winter or summer.

21. **Rice.**—This is a crop of particular importance to the Sabi Valley, but is not grown to any extent in the U.S.A., except in parts of California, and particularly the Sacramento Valley.

As rice is grown in flooded fields, it requires an impervious sub-soil. The water requirement was stated to be four to six acre-feet per acre. Yields average about 2,000 lbs. per acre, but in some parts they go up to 3,500 lbs. In California the Japanese type is grown.

Very accurate levelling of the land is required, but hand labour is reduced to a minimum.

Rice has an important use in reclaiming saline soils, and has been used for this purpose in the Imperial Valley. I obtained notes from a paper written on this aspect.

It was stressed that if reaping is to be done mechanically, there must be a means of draining and drying out the land when required. Further, that it is often necessary to be able to dry the grain artificially, as it is harvested at 25 per cent. moisture.

I was not able, however, to follow this up when I reached the rice-growing areas.

Rice often follows a legume, which should receive a phosphatic fertiliser. The rice should not in that case need nitrogenous fertilisers, but may require more phosphates. A common rotation in California is rice, beans, wheat, beans, and then back to rice.

I gained the impression that rice-culture has an adverse effect in puddling the soil, and that we should experiment in the basaltic area of the Sabi, for instance, to endeavour to find a suitable rotation of other crops as an alternative to rice.

22. **Pasture Grasses.**—In most of the mixed farming areas irrigated pastures play an important part. In the Boise area, for instance, as much as 18 per cent. of the land was in pasture crops. Much of this is clover, and mixed pasture.

I had useful discussions at Beltsville with Dr. Myers and Mr. M. A. Hein. In connection with mixing grasses with lucerne, in order to avoid the danger of "bloat" in cattle and sheep, Dr. Myers suggested that we might try Rhodes Grass, Dallas, *Phalaris tuberosa*, *Paspalum* and *Bromus catharticum*. He saw no reason why some of their clovers should not be successful here, under irrigation. Mr. Hein suggested other grasses: *Erogrostis chloromelas*, *Erogrostis lehmanniana*, *Festuca arundinaceae* (tall fescue). The latter, he thought, would stand a great deal of heat. Dallas he thought suitable for heavy soils, and Rhodes Grass for lighter soils. He considered that *Andropogon ischaemum* and *A. intermedius* (blue stem) would get along with limited amounts of water, and would be worth trying with lucerne. Most of the above-named are perennial. He suggested checking on "wheat grasses" (*Agropyron elongatum*) at tht Nurseries at Tucson, but unfortunately I had no chance of doing so.

I have discussed the above grasses with the Chief Pasture Research Officer since my return, and find that he already has a number of them under trial.

23. **Feeding, Livestock and Dairying.**—I can hardly overstress the importance of this subject, as affecting the Sabi Scheme, but since I have already made detailed references to it elsewher in this report, I will merely mention it again here.

24. **Citrus.**—Since the Sabi Scheme is primarily intended to produce the staple foods of which Rhodesia is short, I was inclined to treat citrus as something of a side-line, but I saw enough of citrus growing in the States to realise what a valuable side-line it would be to farmers in the Sabi Valley, where the conditions would appear to be nearly ideal.

Admittedly, it is mainly grown in the southern coastal belt of California, but with only about nine or ten inches of (winter) rainfall (plus irrigation), and I saw a great deal on the Yuma Mesa, where the heat is intense and the rainfall only three inches. The Mesa with its deep porous sandy soil suited citrus better than the heavier soils of the Yuma Valley, but it is possible that similar conditions could be found in the Sabi, if the alluvial soils did not prove suitable.

Owing to the increasing use of concentrates, the citrus growers in the U.S.A. market only the best of their crop as fresh fruit. The principal citrus fruits grown are, I was informed, Marsh's Seedless Grapefruit, Eureka (preferred) and Lisbon Lemons, and Valencia (preferred) and Washington Navel Oranges. Other fruits grown in the same areas are Tangerines and Avocado Pears.

Even in Southern California the winters are severe enough to necessitate the use of "smudge" stoves (oil burning) in the groves to raise the temperature. This smoke causes a nuisance in the neighbouring towns, and gives rise to what is known as "smog" (smoke plus fog).

25. **Dates.**—I have already referred to this valuable fruit, and would here merely suggest that dates would be worth trying in the Sabi Valley, particularly in the Native Areas, where a native family could provide its own labour for the various hand operations.

The chief point of doubt is whether the date crop would be damaged by rains in the latter part of the rainy season, since dates are grown in virtually rainless parts of Arizona and California. However, the heavy paper inverted cones used there to protect the bunches of dates might be adequate.

26. **Sugar Cane.**—My report on this point is completely negative, as there is virtually no sugar cane grown in the States, and none at all under irrigation. I obtained, however, a useful paper relating to sugar cane growing in Hawaii.

# Preliminary Report on a Comparison of Several Heavy Yielding Perennial Grasses for the Production of Ensilage

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## I. INTRODUCTION.

In semi-arid countries the protection of arable land from wind erosion should be a major consideration in any agricultural system. In some areas systems of annual cropping can quickly lead to dust bowl conditions, which result in reduced production or eventual abandonment. In many parts of Matabeleland the success of an annual crop often depends on planting coinciding with the first rains. This necessitates winter ploughing, which leaves the land in a condition most susceptible to wind erosion. A perennial crop not only obviates this danger, but if the crop be fairly close growing, the losses of soil by water erosion can be very substantially, if not completely, reduced.

Perennial grasses, besides being particularly valuable in reducing wind and water erosion to a minimum, have the ability of restoring and maintaining structure in the soil (1). All farmers recognise the value of soil crumb structure, but practically all have their quota of poor, structureless lands. Perennial grasses, with their well developed root systems, are particularly well adapted for restoring the structure and are commonly used in leys in older established farming communities.

Their productivity under adverse conditions is another very good reason for the incorporation of perennial grasses in the cropping rotation. Perennial grasses have the ability of ceasing to grow during dry spells and of continuing again when conditions are more favourable. Most annual crops, on the other hand, are stunted by droughty periods and give very much reduced yields as a result.

Work on planted pastures was started on the Central Veld and Pasture Station for Matabeleland towards the end of 1945. Much of this work has, of course, been developmental and until the beginning of the 1948-49 growing season bulking up and preliminary selection of grasses and other pasture plants were the primary considerations.

With the need for perennial crops in mind, and with a view to testing, over a period of years, the yields of seven heavy yielding perennial grasses and comparing them with those of three of the more common annual ensilage crops of Matabeleland, an experiment was laid down at the end of 1948.

The original and main purpose of the trial was to compare over a period of years and at three different espacements, the productivity of seven varieties of perennial grasses, which had been selected previously in preliminary trials as being suitable for the production of ensilage under dry land conditions at Matopos. In order to round off the trial and to provide a comparison between the yields obtained from these perennial grasses and the standard Matabeleland ensilage crops, it was decided to include as varieties in the yield trial maize, sorghum and nyouti (*Pennisetum typhoideum*, also known as Munga and Babala).

[The varieties of and the espacement at which these annual crops are grown, are those recommended for the purpose of this experiment by Mr. T. K. Sansom, the Senior Field Husbandry Officer.]

## II. MANAGEMENT AND METHODS.

Productivity is assessed by dry herbage yields and by the chemical composition of the crops at the time of cutting. In this paper conclusions are based on the dry herbage yields for the seasons 1948-49 and 1949-50 and on the chemical analysis data for the 1948 season.

### 1. DESIGN OF THE EXPERIMENT.

The experimental area occupies about 1½ acres of typical red basement schist soil which had been annually cropped for a considerable period prior to the commencement of the experiment. The soil was in very poor physical condition and a good deal of surface erosion had taken place. A comparatively even slope of approximately 3-4 per cent. runs from north to south over the entire area.

Twenty-four varieties are replicated five times in randomised blocks. Plots are 18 feet square and are separated from each other by 6-foot strips which have been built up in the form of banks to prevent the loss of rain water by run-off.

Varieties are as follows:—

1.—Gold Coast Elephant Grass, *Pennisetum purpureum*, at 3' x 3' esp.
2.—Gold Coast Elephant Grass, *pennisetum purpureum*, at 3' x 6' esp.
3.—Gold Coast Elephant Grass, *Pennisetum purpureum*, at 6' x 6' esp.
4.—Cameroons Elephant Grass, *Pennisetum purpureum*, at 3' x 3' esp.
5.—Cameroons Elephant Grass, *Pennisetum purpureum*, at 3' x 6' esp.
6.—Cameroons Elephant Grass, *Pennisetum purpureum*, at 6' x 6' esp.
7.—R.M.E. Napier, *Pennisetum purpureum* ...... ...... ...... at 3' x 3' esp.
8.—R.M.E. Napier, *Pennisetum purpureum* ...... ...... ...... at 3' x 6' esp.
9.—R.M.E. Napier, *Pennisetum purpureum* ...... ...... ...... at 6' x 6' esp.
10.—Kazungula Setaria, P.1192, *Setaria spacelata* ...... ...... at 3' x 3' esp.
11.—Kazungula Setaria, P.1192, *Setaria spacelata* ...... ...... at 3' x 6' esp.
12.—Kazungula Setaria, P.1192, *Setaria spacelata* ...... ...... at 6' x 6' esp.
13.—Kazungula Setaria, P.1193, *Setaria spacelata* ...... ...... at 3' x 3' esp.
14.—Kazungula Setaria, P.1193, *Setaria spacelata* ...... ...... at 3' x 6' esp.

**15.—Kazungula Setaria, P.1193, *Setaria spacelata* ...... ...... at 6′ x 6′ esp.**
**16.—*Echinochloa pyramidalis* (Limpopo) ...... ...... ...... ...... at 3′ x 3′ esp.**
**17.—*Echinochloa pyramidalis* (Limpopo) ...... ...... ...... ...... at 3′ x 6′ esp.**
**18.—*Echinochloa pyramidalis* (Limpopo) ...... ...... ...... ...... at 6′ x 6′ esp.**
**19.—Guinea Grass, *Panicum maximum* ...... ...... ...... ...... ...... at 3′ x 3′ esp.**
**20.—Guinea Grass, *Panicum maximum* ...... ...... ...... ...... ...... at 3′ x 6′ esp.**
**21.—Guinea Grass, *Panicum maximum* ...... ...... ...... ...... ...... at 6′ x 6′ esp.**
**22.—Maize (Golden Beauty) ...... ...... ...... ...... ...... ...... ...... at 12″x 24″esp.**
**23.—Sorghum (Strain W.S./B.G. ex A.E.S.) ...... ...... ...... ...... at 12″x 18″esp.**
**24.—Nyouti, *Pennisetum typhoideum* (Strain 51/47 ex A.E.S. ...... ...... ...... ...... ...... ...... ...... ...... ...... ...... ...... at 12″x 18″esp.**

**N.B.**—The original stocks of all the perennial grasses, except the R.M.E. Napier and the Guinea Grass, were obtained from the Prinshoff Grass Breeding Station, Pretoria. The Guinea Grass was supplied by the Salisbury Experimental Station and the R.M.E. Napier is a strain that has grown on Rhodes Matopo Estate for many years.

During the 1948 season fertiliser was applied to all plots at the following rate:—

200 lbs. superphosphate
100 lbs. nitrate of soda } per acre.
50 lbs. muriate of potash

It was decided, however, that this dressing was too low, and for the 1949-50 season requirements of Nitrogen and Phosphate were calculated on the basis of an estimated yield of four tons dry matter per acre. This was as follows:—

600 lbs. nitrate of soda } per acre.
200 lbs. superphosphate

The nitrate of soda was applied in three equal dressings during the season. A dressing of two tons agricultural lime per acre was given at the beginning of the season just prior to the application of superphosphate and the first dressing of nitrate of soda.

In yielding the perennial grasses the outside rows were discarded. In the case of the annuals a 3-feet border round each plot was discounted. All plots were cut at the same time, which means that some varieties had passed their optimum stage for ensilage. In future a new procedure will be adopted in which each variety will be cut at its optimum stage.

## 2. YIELDING TECHNIQUE.

**As each plot was cut the total herbage was weighed and then chaffed in a silage cutter. Two large samples were then taken. From one of these, sub-samples were taken for immediate water determinations. In 1949 the other was put aside until all replicates of each treatment had been cut, when the five samples were bulked and thoroughly mixed. Sub-samples were taken from the**

resultant mixture. These were dried at a temperature of between 80° and 90° C. before being sent to Salisbury for chemical analysis. In 1950 it was found necessary to reduce the number of samples, and as a result all samples from each variety were bulked.

### 3. STATISTICAL TECHNIQUE.

The dry matter yields have been analysed statistically for the two seasons individually and also for the two seasons combined. In the individual analyses the variance of the interaction varieties x replicates was taken as the error variance. In the analysis of the data for the combined seasons the bulked variance of the interactions variety x replicate x season, season x replicate and variety x replicate was taken as the error variance.

Chemical analysis data are only available as yet for the 1948-49 season. These have not been analysed statistically (2, 3, 4).

## III. SEASONAL CONDITIONS.

Rainfall is undoubtedly the most important factor affecting seasonal fluctuations in yield. At Matopos the dry season is long and, although good rains maye be expected between November and March, it very rarely occurs that more than two of these months produce satisfactory rains. The average monthly rainfall for the period 1922-46 is given in Table I. Also shown are the figures for 1948-49 and 1949-50.

TABLE I.

**Average Monthly Rainfall (1922-1946) and Monthly Falls for the Seasons 1948-49 and 1949-50.**

| Season | Average 1922-46 | 1948-49 | 1949-50 |
|---|---|---|---|
| July | Trace | 0.00 | 0.00 |
| August | Trace | 0.00 | 0.00 |
| September | 0.16 | Trace | 0.00 |
| October | 0.94 | 1.26 | 0.21 |
| November | 3.25 | 3.73 | 2.68 |
| December | 4.62 | 2.60 | 7.47 |
| January | 5.12 | 9.87 | 0.83 |
| February | 4.52 | 2.93 | 3.88 |
| March | 3.82 | 2.46 | 0.54 |
| April | 0.70 | 0.13 | 0.88 |
| May | Trace | Trace | 0.07 |
| June | Trace | 0.12 | 0.00 |

The experiment was planted at the end of November, 1948, but did not get away to a good start as the December rainfall was low. A few plants which did not take had to be replaced during January and February. Trouble from rats was experienced with the establishment of the annuals and several replantings to fill the gaps were necessary. Good rains fell during January and all plots were well established by the end of the season. Yields for the season were rather low, but were reasonable considering the low rainfall just after planting and that it was the year of establishment.

The 1949-50 season also produced low yields. During this season good rains fell at the end of November and during December, but after that no effective rain fell until the end of February, when over two inches were recorded in one storm. March was dry.

## IV. PHENOLOGY.

Regular phenological observations have been made since the commencement of the experiment. A brief summary of these notes is given hereunder:—

### 1. 1948-49.

For the first month after planting, all plants suffered to a certain extent from drought and, as stated above, a few had to be replaced during January and February. In Table II the percentage replacements for each grass variety are shown.

TABLE II.

| Grass | Replacements 18.1.49 | 9.2.48 | Total Replacements |
|---|---|---|---|
| Gold Coast Elephant Grass | 4.09% | 0.22% | 4.31% |
| Cameroons Elephant Grass | 5.16% | Nil | 5.16% |
| R.M.E. Napier | 1.15% | Nil | 2.15% |
| Kazungula Setaria, P.1192 | 2.58% | 0.22% | 2.80% |
| Kazungula Setaria, P.1193 | 1.51% | Nil | 1.51% |
| *Echinochloa pyramidalis* | 2.15% | 0.22% | 2.37% |
| Guinea Grass | 8.17% | 4.73% | 12.90% |

**NOTE.**—The fact that a very high percentage of the Guinea Grass plants died and had to be replaced is largely because the available planting material was very immature. No record was kept of the number of seeds of the annuals that had to be replaced, but this was very high. Most losses were caused shortly after germination by rats.

By the middle of February all plants were well established and no difference could be seen between wide and close spacings. At this stage the Echinochloa was doing best, having attained a height of 4-5 feet. The West African Elephant Grasses were doing well and stood about 4-feet high. The Gold Coast strain was slightly uneven and not quite as leafy as the Cameroons. Of the Kazungula Setarias the P.1192 strain was temporarily wilted and had produced very few culms, while the P.1193 strain was flowering profusely at a height of 4-5 feet. The R.M.E. Napier had grown well, but had very little leaf, and the Guinea Grass, while well stooled, had very little upright growth. The maize was doing well and tasselling at a height of about 6-feet, and the Sorghum was very even, having attained a height of about 3-feet. The Nyouti at 4-6-feet was rather uneven and stooling was poor.

The plots were cut between 29.3.49 and 23.4.49 by which time all plants were mature. The only treatment that yielded really well was the Sorghum. The maize was poor and rather drought stricken, as also was the R.M.E. Napier. The West African Elephant Grasses and the Echinochloa were fairly good, but were beginning to lose some basal leaves. The two Kazungula Setarias were fair, but the P.1192 strain was rather wilted and had lost some leaf. The Guinea Grass was quite good, although short.

After cutting, the plots that had contained annuals were dug over while the grasses put on a little fresh growth. This was killed by frost in June.

### 2. 1949-50.

By the end of September, 1949, the Elephant Grasses, the Napier and the Echinochloa were growing fairly actively and were being grazed by hares and small buck. The other grasses were still dormant. At this stage it was decided to replace small plants so as to obtain even stands. In order that the replacements should be well established before general growth took place they were watered. This was carried out by using basins so as to cause as little stimulation to surrounding plants as possible. About twice as many Cameroons and Guinea Grass plants had to be replaced as any of the others. For all varieties 7.8% of the 3-ft. x 3-ft. plots, 4.7% of the 3-ft. x 6-ft. plots and 2.3% of the 6-ft. x 6-ft. plots had to be replaced.

The annuals were planted on the 5th December and good rains ensured satisfactory germination. A few replacements had to be made on December 19th to fill gaps made by rats.

By 10.1.1950 all plots were growing well, although some were slightly uneven. The Echinochloa had grown out best, but the West African Elephant Grasses and Kazungula Setaria P.1193 were also doing well. In the Gold Coast, however a border effect was rather noticeable. The R.M.E. Napier, Kazungula Setaria P.1192 and Guinea Grass, although doing well, were somewhat slow. The three annuals were growing very well.

After practically no rain in January, all the plots showed signs of wilting by 9.2.1950. The Maize, Kazungula Setaria P.1192 and the Guinea Grass were the most severely affected, whilst the Sorghum, Nyouti and Kazungula Setaria P.1193 were only slightly better. The Elephant Grasses, Napier and particularly the Echinochloa were losing some basal leaves and the leaf tips were drying off.

The plots were cut between the 16th and 28th March, by which time some were showing definite signs of drying off. The Maize was the worst, followed by Echinochloa, Sorghum, Nyouti and Kazungula Setaria P.1192. The West African Elephant Grasses had lost more leaf, but were standing up well, as was the Kazungula Setaria P.1193. The R.M.E. Napier and the Guinea Grass were badly wilted and some leaves had dried off.

After cutting, the annual plots were again dug over and the perennials put on a little more leaf. This was frosted back on 23.5.1950.

## V. YIELD RESULTS AND DISCUSSION.

In Table III are shown the average yields of green material and oven-dry material in tons per acre for seasons 1948-49 and 1949-50 as well as for the combination of the two seasons. It will be noted that the yields throughout were low. This was partly due to the unsatisfactory rainfall, but was chiefly because of the poor condition of the soil. As stated above, the experiment is sited on very poor, shallow soil, which had been deemed since the 1946-47 season to be too worn out for crop production. On the whole, however, considering the erratic nature of the rainfall and the poor condition of the soil, yields were considered to be fairly satisfactory.

TABLE III.

**Average Green and Dry Matter Yields in Tons per Acre.**

| | | Average Yield in Tons per Acre | | | | | |
|---|---|---|---|---|---|---|---|
| | | Green Weight | | | Dry Weight | | |
| Variety | | 48-49 | 49-50 | Average | 48-49 | 49-50 | Average |
| Sorghum | — | 9.43 | 4.79 | 7.11 | 3.04 | 1.37 | 2.20 |
| Cam. Elephant Grass | 3′ x 3′ | 7.44 | 8.19 | 7.82 | 1.97 | 2.35 | 2.16 |
| G.C. Elephant Grass | 3′ x 3′ | 7.43 | 8.40 | 7.92 | 1.92 | 2.25 | 2.09 |
| Echinochloa | 3′ x 3′ | 5.28 | 5.60 | 5.44 | 1.38 | 2.50 | 1.94 |
| Kaz. Setaria, P.1193 | 3′ x 3′ | 6.27 | 5.19 | 5.73 | 1.99 | 1.85 | 1.92 |
| G.C. Elephant Grass | 3′ x 6′ | 7.14 | 7.12 | 7.13 | 1.81 | 2.01 | 1.91 |
| Nyouti | — | 9.25 | 4.17 | 6.71 | 2.39 | 1.26 | 1.83 |
| Kaz. Setaria, P.1193 | 3′ x 6′ | 5.81 | 5.83 | 5.82 | 1.65 | 1.89 | 1.77 |
| Guinea Grass | 3′ x 3′ | 4.45 | 4.69 | 4.57 | 1.49 | 2.02 | 1.76 |
| Echinochloa | 3′ x 6′ | 4.06 | 5.98 | 5.02 | 1.16 | 2.20 | 1.68 |
| Cam. Elephant Grass | 3′ x 6′ | 5.01 | 7.12 | 6.07 | 1.27 | 2.03 | 1.65 |
| Kaz. Setaria, P.1192 | 3′ x 3′ | 5.93 | 4.96 | 5.45 | 1.65 | 1.59 | 1.62 |
| G.C. Elephant Grass | 6′ x 6′ | 5.28 | 6.47 | 5.88 | 1.32 | 1.81 | 1.57 |
| Cam. Elephant Grass | 6′ x 6′ | 5.32 | 6.38 | 5.85 | 1.32 | 1.82 | 1.57 |
| Guinea Grass | 3′ x 6′ | 3.14 | 3.85 | 3.50 | 1.37 | 1.76 | 1.57 |
| Maize | — | 7.61 | 4.47 | 6.04 | 1.69 | 1.43 | 1.56 |
| R.M.E. Napier | 3′ x 3′ | 4.53 | 5.54 | 5.04 | 1.24 | 1.51 | 1.37 |
| Kaz. Setaria, P.1192 | 3′ x 6′ | 5.33 | 4.79 | 5.06 | 1.27 | 1.43 | 1.35 |
| Echinochloa | 6′ x 6′ | 2.98 | 5.02 | 4.00 | 0.78 | 1.83 | 1.30 |
| R.M.E. Napier | 3′ x 6′ | 4.48 | 4,82 | 4.65 | 1.01 | 1.33 | 1.17 |
| Guinea Grass | 6′ x 6′ | 2.48 | 3.87 | 2.68 | 0.82 | 1.53 | 1.17 |
| Kaz. Setaria, P.1193 | 6′ x 6′ | 4.02 | 4.09 | 4.06 | 1.06 | 1.26 | 1.16 |
| R.M.E. Napier | 6′ x 6′ | 4.08 | 4.03 | 4.06 | 0.87 | 1.11 | 0.99 |
| Kaz. Setaria, P.1192 | 6′ x 6′ | 3.02 | 3.63 | 3.33 | 0.65 | 1.08 | 0.87 |

At P = 0.05 the Minimum Differences Significant (M.D.S.) are as follows for the oven-dry data:—

| | M.D.S. Treatments | M.D.S. Spacings |
|---|---|---|
| 1948-49 Season | 0.63 tons | 0.24 tons |
| 1949-50 Season | 0.41 tons | 0.16 tons |
| Both Seasons | 0.37 tons | 0.14 tons |

In Tables IV and V the average dry matter yields for all plots of each variety are shown. In the case of the perennials (Table IV), the yields of all replicates and all treatments for each variety have been bulked and averaged.

## TABLE IV.

### Average Yields of Perennials (Dry Matter in Tons per Acre).

| Variety | 1948-49 | 1949-50 | Average |
|---|---|---|---|
| Gold Coast Elephant Grass | 1.68 | 2.02 | 1.86 |
| Cameroons Elephant Grass | 1.52 | 2.07 | 1.79 |
| Kazungula Setaria, P.1193 | 1.57 | 1.67 | 1.62 |
| *Echinochloa pyramidalis* | 1.11 | 2.18 | 1.58 |
| Guinea Grass | 1.23 | 1.77 | 1.50 |
| Kazungula Setaria, P.1192 | 1.19 | 1.37 | 1.45 |
| R.M.E. Napier | 1.31 | 1.32 | 1.18 |

At P = 0.05 the Minimum Differences Significant are:—

| | |
|---|---|
| 1948-49 Season | 0.36 tons |
| 1949-50 Season | 0.24 tons |
| Both Seasons | 0.21 tons |

## TABLE V.

### Average Yields of Annuals (Dry Matter in Tons per Acre).

| Variety | 1948-49 | 1949-50 | Average |
|---|---|---|---|
| Sorghum | 3.04 | 1.37 | 2.20 |
| Nyouti | 2.39 | 1.26 | 1.83 |
| Maize | 1.69 | 1.43 | 1.56 |

At P = 0.05 the Minimum Differences Significant are:—

| | |
|---|---|
| 1948-49 Season | 0.63 tons |
| 1949-50 Season | 0.41 tons |
| Both Seasons | 0.37 tons |

**In Table VI the chemical analysis data, as well as the Crude Protein in pounds per acre for the season 1948-49 are shown. The data for the season 1949-50 are not yet available.**

## TABLE VI.

**Chemical Composition of Herbage and the Yield of Crude Protein in Pounds per Acre for the Season 1948-49. Percentage Expressed in Terms of Oven-Dry Material.**

| Herbage | | % Total Ash | % Acid Sol. Ash | % P205 | % CaO | % Crude Protein | Crude Protein Lbs/ Acre |
|---|---|---|---|---|---|---|---|
| Nyouti | — | 9.63 | 5.26 | 0.28 | 0.64 | 8.17 | 390.5 |
| Sorghum | — | 7.54 | 3.38 | 0.18 | 0.49 | 5.46 | 332.0 |
| Cam. Elephant Grass | 3′ x 6′ | 10.77 | 7.83 | 0.25 | 0.28 | 9.63 | 244.6 |
| Cam. Elephant Grass | 3′ x 3′ | 10.28 | 6.43 | 0.22 | 0.26 | 6.11 | 240.7 |
| G.C. Elephant Grass | 3′ x 6′ | 10.80 | 5.53 | 0.20 | 0.42 | 6.60 | 238.9 |
| Cam. Elephant Grass | 6′ x 6′ | 10.46 | 6.53 | 0.19 | 0.31 | 8.77 | 231.5 |
| Guinea Grass | 3′ x 6′ | 11.42 | 8.11 | 0.19 | 0.63 | 8.44 | 231.3 |
| Kaz. Setaria, P.1192 | 3′ x 3′ | 10.45 | 6.31 | 0.21 | 0.51 | 7.21 | 227.9 |
| Maize | — | 9.15 | 4.48 | 0.23 | 0.59 | 6.57 | 222.1 |
| Guinea Grass | 3′ x 3′ | 10.71 | 7.55 | 0.17 | 0.64 | 7.25 | 216.1 |
| G.C. Elephant Grass | 3′ x 3′ | 10.00 | 4.95 | 0.17 | 0.34 | 5.48 | 210.4 |
| Kaz. Sectaria, P.1193 | 3′ x 6′ | 7.80 | 5.93 | 0.17 | 0.35 | 6.34 | 209.2 |
| Kaz. Setaria, P.1192 | 3′ x 6′ | 9.51 | 5.95 | 0.24 | 0.54 | 8.22 | 208.8 |
| G.C. Elephant Grass | 6′ x 6′ | 10.00 | 6.31 | 0.24 | 0.37 | 7.78 | 205.4 |
| Kaz. Setaria, P.1193 | 3′ x 3′ | 7.00 | 5.74 | 0.15 | 0.28 | 4.78 | 190.2 |
| R.M.E. Napier | 3′ x 6′ | 10.72 | 7.06 | 0.23 | 0.44 | 8.45 | 170.7 |
| Kaz. Setaria, P.1193 | 6′ x 6′ | 7.51 | 6.25 | 0.20 | 0.28 | 7.45 | 157.9 |
| R.M.E. Napier | 6′ x 6′ | 10.18 | 7.23 | 0.22 | 0.35 | 8.93 | 155.4 |
| R.M.E. Napier | 3′ x 3′ | 10.22 | 6.61 | 0.28 | 0.34 | 6.24 | 154.8 |
| Guinea Grass | 6′ x 6′ | 11.66 | 8.25 | 0.17 | 0.57 | 8.54 | 140.1 |
| Kaz. Setaria, P.1192 | 6′ x 6′ | 9.22 | 7.06 | 0.23 | 0.33 | 9.12 | 118.6 |
| Echinochloa | 3′ x 6′ | 10.22 | 5.76 | 0.11 | 0.68 | 4.80 | 111.4 |
| Echinochloa | 3′ x 3′ | 9.60 | 5.45 | 0.15 | 0.67 | 3.94 | 108.7 |
| Echinochloa | 6′ x 6′ | 10.67 | 5.91 | 0.14 | 0.71 | 5.37 | 83.8 |

Footnote.—The above tables are interesting. All yields have been low, but it is considered that this is largely due to the fact that the soil is both shallow and very poor. Had the experiment been laid out on more fertile soil, the yields would undoubtedly have been very much higher.

(Footnote continued on next page)

In the experiment under review, judging varieties as a whole, in the first season the Sorghum gave significantly higher yields than any of the other crops, while the Nyouti out-yielded all treatments except Gold Coast Elephant Grass at spacings of 3-feet x 3-feet and 3-feet x 6-feet, the Sorghum and the Cameroons Elephant Grass and Kazungula Setaria, P.1193, both at spacings of 3-feet x 3-feet. Maize was out-yielded by the Sorghum and Nyouti, but gave more than the R.M.E. Napier, both Kazungula Setarias, the Echinochloa and the Guinea Grass (all at 6-feet x 6-feet), as well as R.M.E. Napier at 3-feet x 6-feet.

Of the grasses, the Gold Coast Elephant Grass at 3-feet x 3-feet produced more than the Cameroons strain at 3-feet x 6-feet, the R.M.E. Napier at all spacings, the Echinochloa and Kazungula Setaria, P.1192, both at 3-feet x 6-feet and 6-feet x 6-feet spacings and the Kazungula Setaria, P.1193, and Guinea Grass at 6-feet x 6-feet spacings.

The yields of the Cameroons Elephant Grass and the Kazungula Setaria, P.1193, at 3-feet x 3-feet were about the same, but both produced more than the Cameroons Elephant Grass at 6-feet x 6-feet, while the latter also out-yielded Gold Coast Elephant Grass at 6-feet x 6-feet. The yields of the R.M.E. Napier, the Echinochloa, the Kazungula Setaria, P.1192, and the Guinea Grass were low.

Fairly low yields are to be expected from the perennial crops during the year of establishment and the 1949-50 season showed up considerable differences in the order of yields.

In this season the Sorghum and Nyouti were out-yielded by the two West African Elephant Grasses and the Echinochloa at all spacings, the Kazungula Setaria, P.1193, at 3-feet x 3-feet and 6-feet x 6-feet, and the Guinea Grass at 3-feet x 3-feet. The Guinea Grass at 3-feet x 6-feet did better than Nyouti. Maize also produced a small crop which was not significantly greater than those of Nyouti or Sorghum.

Table VII shows yields obtained from some of the perennial grasses (all planted at 3-feet x 3-feet spacings) in the year of establishment on good, fertile soil.

## TABLE VII.

**Yield of Crude Protein and Green Material of Five Heavy Yielding Perennial Grasses (Season 1947-1948).**

| *Grass* | Yield per Acre<br>Pounds<br>Crude Protein | <br>Tons<br>Green Material |
|---|---|---|
| Gold Coast Elephant Grass | 1193.9 | 30.03 |
| Cameroons Elephant Grass | 1553.6 | 31.85 |
| Kazungula Setaria, P.1192 | 545.2 | 18.08 |
| Kazungula Setaria, P.1193 | 724.2 | 23.91 |
| *Echinochloa pyramidalis* (Limpopo) | 567.0 | 18.75 |

The yields of Gold Coast Elephant Grass, Cameroons Elephant Grass and the Echinochloa were better than those of any other crops. The Kazungula Setaria, P.1193, and the Guinea Grass also did well, but R.M.E. Napier and the Kazungula Setaria, P.1192, were again low and were grouped with the Maize, Sorghum and Nyouti.

The average yields for the two seasons raise the Sorghum and Nyouti considerably, and in this case they are grouped with the best grasses. These are Gold Coast Elephant Grass at 3-feet x 3-feet and 3-feet x 6-feet, Cameroons Elephant Grass, the Kazungula Setaria, P.1193, and the Echinochloa at 3-feet x 3-feet. Over the two years, however, the Sorghum gave a higher average yield than the Nyonti. The average Maize yield is well below those of the better grasses.

Results to date show that while the annual crops did better during the first year than the perennial grasses, the latter are now coming into their own and may very well do better in the future. All yields so far have been greatly reduced by the poor condition of the soil and by the erratic rainfall. There are signs that some of the grasses, particularly the R.M.E. Napier and the Kazungula Setaria, P.1192, may have been killed off during the 1950 dry season and the future results will be interesting. In future no grasses will be replaced and so those that succumb to droughts or other causes will be automatically eliminated.

The chemical composition data shown in Table VI are interesting, but it is felt that they do not entirely reflect the true position as it was not always possible to cut plots at the optimum stage for ensilage. In many cases the herbage was allowed to become too old, with a resultant loss in feeding value. It is interesting to note, however, that almost without fail, the crude protein content of the grasses at the close spacings was lower than that of those at 3-feet x 6-feet spacings, which in turn was lower than the percentage crude protein of the grasses at the widest espacements. The production of crude protein in pounds per acre, however, somewhat reverses the position.

So far the two West African Elephant Grasses are the outstanding grasses at all spacings, and do not appear yet to be suffering from lack of space. The Kazungula Setaria, P.1193, did well at all spacings during the first season, but dropped off considerably during the second. This was probably due more to the rainfall than to anything else. The Echinochloa on the other hand did well the second year at all espacements, but badly in the first season. It is probable that this was brought about chiefly by stool enlargement as these have increased considerably in size since the year of establishment.

The yields of R.M.E. Napier and the Kazungula Setaria, P.1192, have been poor at all espacements throughout, while the Guinea Grass improved considerably in the second season.

Combining all spacings, the Gold Coast and Cameroons Elephant Grasses have been the best perennials throughout, although in the first season their yields were equalled by the Kazungula Setaria, P.1193, and in the second by the Echinochloa. The R.M.E. Napier has given the lowest yields consistently.

In the first season the Sorghum out-yielded the Nyouti, which did better than the Maize, but in the second there was no significant difference between any of the yields of the annuals. Over the two seasons, the Sorghum did the best, whilst Maize and Nyouti gave similar yields.

Not only is the yield of a crop important, but economics enter into the question as well. The cost of planting and maintaining a perennial crop such as Elephant Grass is undoubtedly lower than the costs incurred in producing annual crops.

A heavy-yielding perennial grass to be used for ensilage would fit in admirably in a long-term crop rotation. Unfortunately, grass is very seldom recognised as a crop. More often than not the farmer regards it as "something for nothing," and does not give it the care it deserves. Grass, therefore, by virtue of the fact that it is hardy and is undoubtedly one of our most valuable assets, is usually taken for granted and is seldom properly managed.

## VI. SUMMARY.

A preliminary report has been presented on the first two seasons' results of an experiment in which the yields of seven heavy-yielding perennial grasses and of three annual crops are compared. The experiment will continue for several years, but the results to date are interesting.

It has been shown that while a good silage Sorghum out-yielded the best perennial grasses in the first season, and while Nyouti gave more than all of the perennial grasses except Gold Elephant Grass at spacings of 3-feet x 3-feet and 3-feet x 6-feet and Cameroons Elephant Grass and Kazungula Setaria, P.1193, both at spacings of 3-feet x 3-feet, the perennial grasses did considerably better during the second season. The average yields for the two seasons place the Sorghum and Nyouti with Gold Coast, Cameroons, the Echinochloa and the Kazungula Setaria, P.1193. Maize was out-yielded by these better perennial grasses.

No differences have yet become apparent with regard to spacings, although it is probable that in future years the plots at the closer spacings will deteriorate.

The West African Elephant Grasses have given the best results to date in company with Sorghum, Nyouti, the Echinochloa and Kazungula Setaria, P.1193.

The need for the inclusion of perennial crops in arable rotations is stressed.

## VII. REFERENCES.

(1) HALL, SIR D.—"The Soil: An Introduction to the Scientic Study of the Growth of Crops."

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## VIII. ACKNOWLEDGMENTS.

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# Price List of Forest-tree Transplants, Ornamental Trees and Shrubs, Hedge Plants, Creepers and Seeds

## OBTAINABLE AT THE GOVERNMENT FOREST NURSERY, SALISBURY

## AS AT 1st NOVEMBER, 1950

1. Transplants of forest trees, etc., are obtainable at the subjoined rates and subject to stocks and containers being available.

2. Orders should be addressed to the Chief Conservator of Forests, Salisbury; or Manager, Forest Nursery, P.O. Box 111, Causeway, Salisbury.

3. **All orders must be accompanied by a remittance in cash, bank note, postal order, draft or cheque, made payable to the Department of Agriculture, Salisbury. Under no circumstances will plants or seeds be sent out or taken away from the Nurseries unless paid for. Stamps to the value of one shilling will be accepted.**

4. All transplants are despatched at Rate 10 on railways at purchaser's risk. The transplants are watered as far as this is possible by the railway staff.

5. All prices quoted are for delivery free at any railway station or siding in Southern Rhodesia. **Road motor service charges are payable by consignee and must be included in remittances, otherwise plants will be railed to nearest Station or Siding.**

6. Purchasers of trees contained in boxes of 50 trees are requested to return boxes, carriage forward, to the nursery from which they are obtained, or to the Manager, Forest Nursery, Salisbury. **If the boxes are not returned within two months from date of issue, they will be charged for at 1/- each respectively.**

7. Forest tree transplants only will be reserved and no guarantee can be given that ornamental trees, shrubs and climbers listed will be available. Orders for over 1,000 conifers should be

placed not later than the 30th April and for over 1,000 Eucalypts not later than the 31st August immediately preceding the planting season. Orders will be executed in order of receipt and every effort will be made to comply with instructions of purchasers.

8. Transplants of forest trees, when quoted at per 1,000, are grown in boxes containing 50 transplants. The average weight of box is 50 lbs.

9. Shrubs and ornamental plants in single tins have a weight of about 5 lbs.

10. To purchasers of forest trees only, the following reductions are made:

(a) When the number exceeds 1,000, the price is £3 5s. per 1,000.

(b) When the number exceeds 5,000, the price is £2 14s. per 1,000.

11. Orders for seed are posted or railed free of charge.

12. Though every care is taken to supply trees and seeds true to name and of good quality, no guarantee can be given in this respect, more particularly in regard to seed.

13. Intending tree planters are invited to apply to the Chief Conservator of Forests, Division of Forestry, Salisbury, for advice as to the most suitable trees for growing in the various climates and soils of the Colony, and on the best methods to adopt in the formation of plantations, wind breaks and shelter belts.

14. **No responsibility taken after trees, shrubs, etc., have been accepted by the Railways. Any claim for loss or death should be made to the Railway Company.**

15. This list cancels all previous lists.

16. Hours of Business: Weekdays, 9 a.m. to 1 p.m. and 2 p.m. to 4.30 p.m. Saturdays, 9 to 11 a.m. Closed on Sundays and Public Holidays.

**Price of Transplants.** For convenience, the following symbols are used to indicate the purchase prices of transplants:

A—Trees, 50 in box, 4s. 6d. per box; £3 5s. per 1,000; £2 14s. per 1,000 for orders over 5,000.

E—Trees and shrubs from 1s. each unless otherwise stated. Larger trees in half petrol tins from 3s. each.

| Botanical Name | Common Name | Remarks | Price of trans-plants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Callitris calcarata | Black cypress pine | Usually rather slow growing, but reaches a fair size and produces a valuable durable softwood. Suited for dry country planting, especially in sandy soil. Good shelter for orchards, etc. | A.E. | 15s. | 1s. |
| Casuarina cunninghamiana | Beefwood | A fine large shade tree, suitable for avenues and narrow belts. Requires deep soil in drier localities. The foliage is useful for stock fodder, and the tree stands lopping well. | A.E. | | 2s.<br>pkt. 1s. |
| Cedrela mexicana | — | A rapid-growing, handsome semi-deciduous tree. Approximately intermediate between C. odorata and C. toona. | E. | | |
| Cedrela odorata | — | A rapid-growing tree similar to Cedrela toona, but with lighter foliage. Likely to do well on heavy soils, fairly free from frost. 30 to 40 feet in height. | E. | | |
| Cedrela toona | Toon tree | A rapid-growing, handsome, semi-deciduous tree, suited for moister localities where frost is slight. Yields a valuable soft timber. Recommended for shade and ornament. | A.E. | 15s. | 1s. |
| Cryptomeria japonica | Japanese cedar | A quick-growing coniferous tree, only suitable for high rainfall areas. | E. | | |
| Cupressus arizonica | Arizona cypress | A hardy evergreen tree, suitable for dry localities, but requiring a well-drained and rather deep soil. Useful for shelter belts and also for hedges when closely planted. | A.E. | 15s. | 1s. |
| Cupressus lawsoniana | Lawson's cypress | A handsome slow-growing cypress best suited to the mist belt and higher altitudes. | E. | | |

| | | | | | |
|---|---|---|---|---|---|
| **Cupressus lusitanica** | Portuguese cypress | A fast-growing cypress, producing an excellent softwood timber, but requires a moist, cool climate and a good soil. May well be used for shelter and hedges in favourable localities. | A.E. | 5s. | 6d. |
| **Cupressus sempervirens, var. stricta** | Common upright cypress | An ornamental tree for gardens and cemeteries. Also useful as a shelter tree. | E. | 15s. | 1s. |
| **Cupressus torulosa** | Himalayan cypress | A good tree for timber, hedges and shelter. Withstands much cold and drought. Not very soil exacting, but will not stand waterlogging. Fairly frost-hardy. A very reliable tree. | A.E. | 10s. | 9d. |
| **Eucalyptus botryoides** | Bangalay | A large-leaved, heavy-foliaged gum. Quick growing. Suitable for granite and red soils. Withstands frosts, but not very drought-resistant. | A. | 15s. | 1s. |
| **Eucalyptus citriodora** | Lemon-scented gum | A clean-boled tree, producing an excellent timber. Leaves lemon-scented. Suited for wetter regions and on the better soils in the lower rainfall regions. Will not withstand much frost or drought. Flowers prolifically, rendering it very useful for honey production. | A. | 15s. | 1s. |
| **Eucalyptus crebra** | Narrow-leaved ironbark | A slow-growing, deep-rooting species, producing excellent timber. Withstands drought and light frosts. | A. | 15s. | 1s. |
| **Eucalyptus ficifolia** | Red flowering gum | A small tree with showy flowers. Grows better in the higher rainfall areas. | E. | | |
| **Eucalyptus maculata** | Spotted gum | One of the best trees for timber production or shelter in the wetter areas, being fairly hardy to drought but not to frost. Produces an excellent timber. | A | 15s. | 1s. |
| **Eucalyptus maideni** | Maiden's gum | A very-fast growing, large tree, with bluish foliage in youth. Fairly drought and frost resistant. Will grow on poor soils if deep and well-drained. Produces a good, strong, useful timber. | A. | 30s. | 2s. |

| Botanical Name | Common Name | Remarks | Price of trans-plants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Eucalyptus melliodor | Yellow box ...... ...... ...... | A medium-sized tree, useful for shelter belts. Produces a tough, durable timber. Very resistant to drought and frost. Valuable for honey production, having abundant sweet flowers. | A. | 15s. | 1s. |
| Eucalyptus microcorys | Tallow-wood ...... ...... | A neat, heavily-foliaged tree suitable for high rainfall areas. | A | 15s. | 1s. |
| Eucalyptus paniculata | Grey ironbark ...... ...... | A very good timber tree, with heavy foliage. Suitable for the moister regions, with a deep, fertile soil. Withstands some drought, but is frost-tender. Yields an excellet, hard, durable wood. | A. | 15s. | 1s. |
| Eucalyptus punctata .. | Leather jacket ...... ...... | A tree of fair size, yielding a good, durable timber. Adaptable as regards soil and climate, but will not withstand a dry cold climate. | A. | 15s. | 1s. |
| Eucalyptus rostrata ...... | Red gum ...... ...... ...... | Produces an excellent and durable hardwood. Withstands drought, heat, brak, flooding and a good deal of frost. One of the best species for planting in Southern Rhodesia, except in sour soil and wet mountain regions. | A. | 15s. | 1s. |
| Eucalyptus saligna ...... | Sydney blue gum ...... | A fast-growing, useful tree, producing a useful medium hardwood. Thrives on deep, fertile soils in the heavier rainfall areas. Tender to frost and drought. | A. | 15s. | 1s. |
| Eucalyptus tereticornis | Forest red gum ...... | Similar to Eucalyptus rostrata, and can be planted along with it, except in areas liable to flooding and great heat. Perhaps not quite as drought-resistant. | A. | 15s. | 1s. |

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|---|---|---|---|---|---|
| Grevillea robusta | Silky oak | A handsome tree which thrives best in moist, warm localities. Useful for ornament, shade and timber. Frost-tender and not resistant to drought. If the locality is unsuitable, it may grow well for several years and then die out. | E. | | |
| Jacaranda mimosifolia | Jacaranda | An ornamental deciduous tree with feathery foliage and abundant blue flowers, which appear in spring. Best development is attained in the moister regions, but the tree withstands drought to a surprising extent, and may be planted in the drier regions if the soil is reasonably deep and fertile. It is tender to cold and frost, and may need protection in its earlier youth. | E. | | |
| Pinus canariensis | Canary Island Pine | Hardy to drought, but not to severe frost. Best suited for planting on higher altitudes and in higher rainfall areas. Slow growth in early youth, then more rapid in later years. A handsome tree with inverted, umbrella-like branches, not spreading. Yields an excellent softwood timber. | A.E. | 15s. | 1s. |
| Pinus caribaea | Slash Pine | A pine suitable for the higher rainfall areas. Not successful on poor, dry sites. | A.E. | | |
| Pinus halepensis | Aleppo pine | A drought-resistant pine which will grow on limestone and shale soils. Not recommended for plantations, but can be used for shelter and ornamental purposes in the drier regions. | A.E. | 15s. | 1s. |
| Pinus patula | Patula pine | A fast-growing pine with graceful drooping needles. Does best in higher rainfall areas. Produces a useful softwood. | A.E. | 15s. | 1s. |

| Botanical Name | Common Name | Remarks | Price of transplants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Pinus radiata (insignis) | Remarkable pine | A large tree of very rapid growth, producing a useful softwood. Most at home in the heavier rainfall areas. Does not like sour or poorly-drained soils. Frost-hardy but not drought-resistant, usually failing at an early age in the drier regions. It should be planted with caution in areas under 30-inch rainfall. Recently this tree has been severely attacked by *Diplodia pinea* and it is advised that the Forest Department be consulted when new plantations are contemplated. | A.E. | 15s. | 1s. |
| Pinus longifolia | Chir pine | A somewhat slow-growing pine, but useful to plant in localities where the climate and soil are doubtful at the higher elevations. For timber and ornamental purposes. A useful tree in all respects. | A.E. | 15s. | 1s. |
| Pinus taeda | Loblolly pine | A pine suitable for the higher rainfall areas. | A.E. | | |
| Populus alba | White poplar | A rapid-growing poplar, requiring a good, deep soil in close proximity to running water. Propagated by suckers. Deciduous. | Suckers at 9s. per 100 | | |
| Populus deltoides, var. missouriensis | Carolina poplar | A very fast-growing poplar, producing a very good timber for matches. Requires a rich, moist, alluvial soil. Moderately frost-hardy. Does not like stagnant water. | E. | | |
| Salix babylonica | Weeping willow | A useful timber and ornamental tree, requiring a moist, well-drained soil which is occasionally flooded. Not suited for ground in which water is stagnant. | 4d. each | | |
| Salix caprea | Goat willow | A shrub or small tree preferring moist well-drained soil and occasional flooding. | 4d. each. | | |
| Salix purpurea | Purple willow | As for Salix caprea. | 4d. each. | | |
| Salix viminalis | Common osier | As for Salix caprea. | 4d. each. | | |

## Ornamental Trees, Shrubs and Hedge Plants

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| **Abelia floribunda** | — | A shrub with myrtle-like leaves, evergreen if watered. Pink-white flowers in profusion. Is used for hedges in Natal. | E. |
| **Acacia baileyana** | Bailey's Wattle | A small tree with beautiful foliage and yellow flowers. | E. |
| **Acer negundo** | Box elder | A medium-sized ornamental tree suited to the better rainfall areas. | E. |
| **Acrocarpus fraxinifolius** | — | A small tree up to 40 feet in height; attractive foliage. Fast growing. | E. |
| **Alstonia scholaris** | — | A white-flowered shrub, 6 feet high, similar to Oleander. | E. |
| **Bauhinia acuminata** | Bauhinia | A small tree, flowering profusely in early spring. White flowers. Hardy. | E. |
| **Bauhinia punctata** | Pride of de Kaap | A rambling shrub, bearing orange-red flowers. Hardy. | E. |
| **Bauhinia purpurea** | Bauhinia | Similar to the Bauhinia acuminata, but with mauve flowers. Hardy. | E. |
| **Bolusanthus speciosus** | Rhodesian tree wisteria | An indigenous semi-deciduous tree with blue flowers at the end of long stalks. Ornamental. | E. |
| **Buddleia sp.** | Blue buddleia | A medium-sized shrub with sweet-scented blue flowers. Useful as a hedge. Rapid-growing, but frost-tender. | E. |
| **Buddleia sp.** | Yellow buddleia | A rank-growing, yellow-flowering shrub. Rapid-growing. Frost tender. Both Buddleias are very subject to leaf-eating beetles. | E. |
| **Callistemon speciosus** | Bottlebrush | A scarlet-flowering shrub of drooping habit. Makes an excellent hedge if trimmed along the top only. | E. |
| **Calodendron capense** | Cape chestnut | A fine flowering tree, with white spotted purple flowers, but rather slow. Prefers the moister localities. | E. |

| Botanical Name | Common Name | Remarks | Price of trans-plants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Casimiroa edulis | Mexican apple | A large, rapid-growing tree, 30-40 feet in height, evergreen, and bears a delicious fruit. A fine shade tree if pruned to stake early. | E. | | |
| Cassia capensis | Cape laburnum | A rapidly growing shrub, bearing masses of bright yellow flowers. | E. | | |
| Cassia caruda | — | Tree up to 20 feet high with masses of yellow flowers. | E. | | |
| Cassia siamea | — | Grows fairly rapidly and is easy to cultivate. Yellow flowers. | E. | | |
| Cassia spectabilis | — | A native of Tropical America. Grows fairly rapidly and produces masses of yellow flowers. Tends to be bushy and so requires pruning. | E. | | |
| Castanospermum australe | Australian chestnut | A very fine shade tree similar in growth to Cedrela but with shiny evergreen leaves and pretty flowers. Seeds poisonous. | E. | | |
| Ceiba pendandra | Kapok | A tree with a spiny trunk and showy rose-coloured flowers. | E. | | |
| Citharexylum sp. | — | A deciduous shrub up to 15 ft. in height. Grown for its lovely leaves, which become highly coloured in autumn. | E. | | |
| Croton sylvaticus | Mount Selinda linden | A large-leaved, deciduous tree from Melsetter. | E. | | |
| Cyphomandra betacea | Tree tomato | The well-known tree tomato. Will grow anywhere where Paw Paws will thrive. | E. | | |
| Dais cotinifolia | — | Small indigenous tree producing small heads of lilac-like flowers. | E. | | |
| Delonix regia | Flamboyant | A handsome red-flowering, feathery-foliaged tree. Very frost tender. Flowers best on stony ground. | E. | | |
| Dodonea viscosa | — | Indigenous shrub. Makes a good hedge in Matabeleland, but dies out after a few years in Mashonaland. | A.E. | | |

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| **Duranta alba** | White tree forget-me-not | Similar to Duranta repens but has white flowers. | E. |
| **Duranta repens** | Tree forget-me-not | A medium-sized, deciduous shrub with blue flowers. Useful as a hedge. Very hardy. | E. |
| **Ekebergia capensis** | — | An attractive fairly fast-growing tree. | E. |
| **Eranthemum sp.** | — | A shrubby herbaceous plant covered with intense blue flowers in the autumn. Likes shade. Evergreen. 3 feet high. | E. |
| **Eugenia braziliensis** | Brazilian cherry | A small shrub, bearing scarlet-coloured, edible fruits. A useful hedge plant. | E. |
| **Euphorbia splendens** | Christ thorn | A small thorny shrub with bright scarlet flowers. Suitable for low hedges and borders. | E. |
| **Fraxinus berlanderiana** | Mexican ash | A useful ornamental tree. | E. |
| **Gleditsia triacanthos** | Honey locust | A hardy tree with prominent thorns. | E. |
| **Hamelia patens** | — | A compact shrub 8 feet to 10 feet in height, flower orange-yellow tubes, a showy shrub. | E. |
| **Heliotropium peruvianum** | Heliotrope | A small shrub with sweet-scented lilac or nearly white flowers. Suitable in flower border. | E. |
| **Holmskioldia sanguinea** | Holmskioldia | A fairly hardy shrub, bearing a profusion of brick-red flowers in large bunches Suitable for hedges. | E. |
| **Holmskioldia sp.** | Holmskioldia | A yellow-flowering, handsome shrub similar to Holmskioldia sanguinea. | E. |
| **Holmskioldia sp.** | Holmskioldia | Similar to the above but mauve bracts and blue flowers. | E. |
| **Hypericum lanceolatum** | St. John's wort | A small, yellow-flowering shrub. Multitudes of flowers. | E. |
| **Iboza riparia** | Rhodesian spirea | A medium-sized blue flowering shrub. | E. |
| **Iochroma tubulosa** | Iochroma | A shrub with dark blue flowers. | E. |
| **Jasminum primulinum** | — | A rambling free-flowering shrub with primrose-yellow flowers. | E. |

| Botanical Name | Common Name | Remarks | Price of trans-plants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Khaya nyasica | Banket mahogany | An evergreen timber tree, fairly fast-growing on deep soils. | E. | | |
| Lagerstrœmia eavesii | Mauve Pride of India | Similar to Lagerstroemia indica but has mauve flowers. | E. | | |
| Lagerstroemia indica | Pride of India | A large ornamental shrub, with pink flowers. Handsome and hardy. | E. | | |
| Ligustrum lucidum | Chinese privet | An excellent hedge plant or ornamental shrub or tree. Can be clipped into shape. Liable to die off in patches or lose its lower leaves unless planted in moist soil of fair depth. Propagated from cuttings or seeds. | A. | | |
| Lagunaria patersonii | — | An evergreen tree with pink flowers, 30 feet high. | E. | | |
| Mangifera indica | Mango | The well-known fruit tree. | E. | | |
| Melia azedarach | Syringa | A deciduous tree, producing a good light timber. Shallow rooting. Withstands drought well. Has fine lilac flowers and persistent yellow berries. Suitable for better rainfall areas and deep sandy soil, but will grow under severe conditions. | E. | | |
| Morus nigra | Common Mulberry | A very large fruited variety. | E. | | |
| Parkinsonia aculeata | Jerusalem thorn | A light-foliaged tree, up to 20 feet high, with little yellow flowers. Very beautiful as isolated specimen on a lawn. | E. | | |
| Peltophorum africanum | Rhodesian wattle | Indigenous tree with yellow flowers. | E. | | |
| Photinia japonica | Loquat | A small evergreen tree with large leaves, bearing yellow edible fruit. | E. | | |
| Phytolacca dioica | Belhambra | A rapid-growing, deciduous tree. Useful for ornament. Timber of no value, but seeds valuable as a poultry or cattle feed. | A. | | |

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| Pittosporum undulatum | Camphor laurel | An Australian evergreen shrub, making an excellent hedge, with shining, green, scented leaves and scented berries. | A. |
| Platanus wrightii | Arizona sycamore | A useful ornamental tree which can grow to a large size. | E. |
| Poinsettia pulcherrima | Poinsettia | A shrub with small yellow flowers surrounded by many large, scarlet, leaf-like bracts. Very showy. Double and single varieties. Also single pink variety. | E. |
| Poinsettia albida | Poinsettia | As above, but with single yellowish white bracts. | E. |
| Punica granatum | Fruiting pomegranate | A shrub or small tree, having shining deciduous leaves, large scarlet flowers and large red fruit Makes a useful hedge when well cut regularly. | E. |
| Punica granatum flora pleni | Double flowered pomegranate | A useful shrub with double scarlet flowers. Does not bear fruit. | E. |
| Pyracantha angustifolia | Hawthorn | Fruits golden, and hang throughout the winter. Evergreen shrub. Useful as a coarse hedge. | A.E. |
| Pyracantha crenulata | Hawthorn | Fruits scarlet. Evergreen shrub if watered in winter. Makes a good border or low hedge. | A.E. |
| Rhus lancea | Karreeboom | A small indigenous tree of graceful appearance, yielding a very durable wood. Useful for ornamental purposes. Forms a fine hedge | A.E. |
| Salvia involucrata | — | A large herbaceous shrub. Rosy-crimson flowers in late summer. Tender to frost. | E. |
| Sapindus mukorossi | Soapberry | Evergreen shade tree of medium height. | E. |
| Schinus molle | Pepper tree | A small evergreen tree with pendulous twigs and rose-coloured berries. Enjoys a hot sunny position but will mildew badly in humid heat. Suitable for the drier areas of the Colony only. | E. |
| Schinus. terebinthifolius | Brazil pepper tree | A small to large-spreading evergreen tree which is covered in Spring with small red berries. | E. |

| Botanical Name | Common Name | Remarks | Price of trans-plants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Schizolobium excelsum | Giant feather duster tree | A tall quick-growing tree from Brazil. The bark is smooth and the leaves all at the top of the tree are very large. The flowers in large panicles are yellow. | E. | | |
| Spathodea campanulata | African flame tree ...... | A handsome, heavy-foliaged tree, bearing bright-red flowers. Suited for the heavier rainfall areas on deep soils. Frost tender. | E. | | |
| Spirea prunifolia ...... | Cape May ...... ...... ...... | White-flowered shrub four feet in height, in single and double varieties. | E. | | |
| Sterculia acerifolia ...... | Australian flame tree | Medium-size deciduous tree bearing masses of scarlet flowers in November. | E. | | |
| Sterculia discolor ...... | White Kurrajong ...... | Recommended as a shade tree for the hot dry areas of the Colony. | E. | | |
| Sterculia diversifolia .. | Black Kurrajong ...... | An evergreen tree up to 30 feet high with greenish-yellow flowers. Should do well in the hot, dry parts of the Colony. | E. | | |
| Streptosolon jamesonii | Streptosolon ...... ...... | A shrub with orange-coloured flowers in dense masses and pale-green foliage. Very frost-tender and delicate. | E. | | |
| Tecoma smithii ...... ...... | Tecoma ...... ...... ...... | An upright, medium-sized shrub with tubular, bright yellow flowers. Forms a useful hedge. Fairly drought-resistant. | E. | | pkt. 1s. |
| Tecomaria capensis .. | Kaffir honeysuckle ...... | A pretty trailing shrub from the Cape, with orange flowers. | E. | | |
| Thevetia peruvianum | Thevetia ...... ...... ...... | Evergreen shrub with narrow shiny leaves. Flowers yellow. Poisonous. | E. | | |
| Thuya orientalis ...... | Thuya ...... ...... ...... ...... | A very hardy conifer that withstands heat, cold and drought, and does not mind heavy soils. Slow-growing. Of small size. Very good for hedges. | E. | | pkt. 1s. |

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| Tipuana speciosa | Tipu tree | A small tree inclined to be spindly at first, but eventually makes quite a good tree. Light foliage, and yellow flowers about the end of October. | E. |
| Trichilia emetica | Natal mahogany | A fine shade tree, evergreen, slow in growth, height to 30 feet, spread up to 50 feet. | E. |
| Ulmus parvifolia | Chinese elm | Small tree with spreading branches. Hardy. | E. |
| Vitex agnus-castus | Hemp tree | A showy blue-flowered shrub, does well in the most unlikely places. | E. |
| | | **Climbers and Creepers** | |
| Antigonon leptopus | Coral creeper | A showy climber, bright pink flowers, forms large bulbs underground. Takes two or three years to reach flowering size, after this it makes a wonderful display yearly. | E. |
| Bignonia chrysoleuca | Lemon shower | Similar to Golden Shower with lemon-coloured flowers. Deciduous. | E. |
| Bignonia jasminoides | — | An evergreen climber with mauve-throated white flowers. | E. |
| Bignonia tweediana | — | A self-clinging climber with yellow flowers. Very showy whilst in flower. | E. |
| Bougainvillæa splendens | Bougainvillaea | Vigorous climber. May be also used as a hedge. Bracts magenta. Fairly frost-hardy. | E. |
| Ficus repens | — | A valuable climber for walls, etc., used in places where the Virginia creeper is grown, but clings to the surface much better than the latter, rather slow at first. | E. |
| Jasminum sambac | Jasmine | A vigorous, evergreen shrub climber with large trusses of fragrant, white flowers. | E. |
| Lonicera periclymenum | Honesuckle (Woodbine) | Hardy climber with sweet-scented yellow flowers. | E. |

| Botanical Name | Common Name | Remarks | Price of trans-plants | Price of seed | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Podranea brycei | Zimbabwe creeper | A rank-growing indigenous creeper with large, pink flowers. | E. | | |
| Pyrostegia venusta | Golden shower | Vigorous creeper. Rapid-growing. Bears masses of orange flowers all the year round. Very useful and hardy. | E. | | |
| | | **Bamboos, etc.** | | | |
| Arundo donax | Spanish reed | A reed, growing 20 feet to 25 feet in height and 1 inch thick, and very superior to the indigenous variety. | Offsets 1s. 6d. each | | |
| Bambusa arundinacea | Whipstick bamboo | About 30 feet. | Offsets 2s. 6d. each | | |
| Bambusa sp. | Indian variety | Similar in growth to the Bindura, with very useful rods. | Offsets 2s. 6d. each | | |
| Oxytenanthera abyssinica | The Bindura bamboo | The only variety indigenous to Rhodesia, giving very useful solid rods, very tough. | Offsets 2s. 6d. each | | |

Offsets of Bamboos supplied during rainy season only.

# Departmental Bulletins

Copies of these Bulletins may be obtained from the Editor, Box 25, Causeway, Salisbury. They are issued to residents of Southern Rhodesia at a charge of 3d., 6d. and 1s. per copy; and at 6d., 1s. and 2s. per copy outside the Colony. The 6d. and 1s. bulletins are marked with an asterisk.

N.B.—The date the article appeared in the Journal is indicated in abbreviated form before the number, e.g., 3/31 No. 815, means that Bulletin 815 appeared in the Journal for March, 1931.

## AGRICULTURE AND CROPS.

3/31. No. 815. New strains of Oats for Southern Rhodesia, by H. C. Arnold, Manager, Agricultural Experiment Station, Salisbury.

5/31. No. 822. Re-stacking of Maize rejected for Export on account of Excessive Moisture.

8/32. No. 859. Twenty-one Years of Plant Introduction, by Major Mundy, Chief Division of Plant Industry.

2/33. No. 878. A.I.V. Silage: Memorandum prepared and circulated by Imperial Bureau of Animal Nutrition.

8/36. No. 997. Reward Wheat: Report on the Baking Properties and Chemical Analyses, by The Rhodesian Milling and Manufacturing Co., Ltd.

7/41. No. 1176. Costings of Farm Operations on the Witchweed Demonstration Farm, Auchendinny, Season 1939-40, by S. D. Timson, M.C., Agriculturist; and G. L. Black, Dip. Agric. (Durham), Manager.

11-12/42. No. 1221. A Description of the more common Rhodesian Wheat Varieties, by T. K. Sansom, B.Sc., Plant Breeder.

3-4/43. No. 1230. Costings of Farm Operations on the Witchweed Demonstration Farm, Auchendinny, Season 1941-42, by S. D. Timson, M.C., Agriculturist; and G. L. Black, Dip. Agric. (Durham), Manager.

9-10/43. No. 1242. Pyrethrum, by H. C. Arnold, Manager, Agricultural Experiment Station.

5-6/44. No. 1265. Notes on Growing Sweet Potatoes, by the Agricultural Branch.

9-10/44. No. 1271. Pyrethrum Drying, by V. A. Beckly, M.C., M.A., A.I.C., and F. McNaughton, B.Sc. (Hons.), Dept. of Agriculture, Kenya.

5-6/45. No. 1305. Wheat Production in Southern Rhodesia, by D. E. McLoughlin, Acting Chief Agriculturist, and T. K. Sansom, B.Sc., Plant Breeder.

9-10/45. No. 1317 Wheat: Examination of the 1944 Southern Rhodesia Crop, by P. Fuller, Chemist, The Rhodesia Milling & Manufacturing Co., Ltd., Bulawayo.

1-2/46. No. 1337. Green Manuring: When to Plough Down the Crop, by S. D. Timson, M.C., Agriculturist.

4-5/46. No. 1341. *The Potato.

7-8/46. No. 1356. Wheat: An examination of the 1945 S.R. Crop, by P. Fuller, Chemist, The Rhodesian Milling & Manufacturing Co., Ltd., Bulawayo.

3-4/47. No. 1387. Wheat: An Examination of the 1946 S.R. Crop, by P. Fuller, Chemist, The Rhodesian Milling & Manufacturing Co., Ltd., Bulawayo.

9-10/47. No. 1415. The Sunflower (*Helianthus annuus*), by S. D. Timson, M.C., Agriculturist.

9-10/47. No. 1416. Kraal Compost, by S. D. Timson, M.C., Agriculturist.

11-12/47. No. 1422. Alternate Green Manure Crops, by S. D. Timson, M.C., Agriculturist.

11-12/47. No. 1426. An Improved Implement for use in Compost Making, by J. D. Scott.

3-4/48. No. 1437. Soya Beans, by H. C. Arnold, Agricultural Experiment Station.

5-6/48. No. 1441. Mechanisation at Gwebi: the "Multiple Hitch," by F. P. Orsmond, Superintendent of the Government Farm, Gwebi.

9-10/48. No. 1453. Report on Southern Rhodesia Wheat Crop by Mr. Blair, Rhodesian Milling Manufacturing Co. Salisbury.

3-4/49. No. 1479. Silage and Silos by W. J. Spafford, Department Agriculture, South Australia.

5-6/49. No. 1483. Why must Root Crops be Hoed by E. W. Russel. Rothamsted and Method of Application of Fertiliser and Green Manure Trials extracted from Salisbury Agricultural Experiment Station Annual Report, Bulletin 830.

5-6/50. No. 1522. Hybrid Maize: Preliminary Disease Resistance Tests, by I. A. C. Ferguson.

*Lucerne Cyclostyled Number.

## ANNUAL REPORTS.

7/27. No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

9/31. No. 830. Annual Report of Experiments, 1929-30, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

6/33. No. 895. Annual Report of Experiments, 1931-32, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

6/35. No. 956. Annual Report of Division of Irrigation for 1934 by P. H. Haviland, B.Sc. (Eng.), Acting Chief Irrigation Engineer.

6/35. No. 957. Annual Report of the Branch of Plant Pathology for 1934 by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., Senior Plant Pathologist.

8/35. No. 962. Annual Report of Chief Entomologist for 1934, by R. W. Jack, Chief Entomologist.

9/35. No. 965. Annual Report of Experiments 1933-34, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

12/35. No. 974. Summary of Annual Report of Division of Forestry for 1934, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Chief Forest Officer.

5/36. No. 986. Annual Report of the Division of Entomology for 1935, by R. W. Jack, Chief Entomologist.

6/36. No. 992. Annual Report of the Agriculturist for the year 1935, by D. E. McLoughlin, Agriculturist.

7/38. No. 1076. Annual Report of Division of Forestry for 1937, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Conservator of Forests.

8/39. No. 1122. Annual Report of the Branch of Plant Pathology for 1938, by J. C. F. Hopkins, D.Sc. (Lond.) A.I.C.T.A., Senior Plant Pathologist.

4/40. No. 1149. Annual Report on Experiments, Agricultural Experiment Station, Salisbury, 1938-1939, by H. C. Arnold, Manager.

5/41. No. 1173. Annual Report of Experiments, 1939-1940, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

3-4/42, No. 1200. Witchweed Demonstration Farm. Costings, 1940-41, by S. D. Timson, M.C., Assistant Agriculturist, and G. L. Black, Manager.

5/42. No. 1204. Annual Report of Experiments, 1940-41, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

7-8/43. No. 1237. Annual Report of Experiments, 1941-42, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.

7-8/44. No. 1268. Annual Report of Experiments, 1942-43, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

3-4/45. No. 1301. Annual Report of Experiments, 1943-44, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

7-8/45. No. 1311. Report of Secretary, Department of Lands, 1944.

9-10/45. No. 1319. Witchweed Demonstration Farm. Final Progress Report: December, 1944, by S. D. Timson, M.C., Agriculturist.

5-6/46. No. 1350. Annual Report of Irrigation Department for 1945.

7-8/46. No. 1355. Annual Report of Chief Animal Husbandry Officer for 1945

7-8/46. No. 1357. Annual Report of Central Food Production Committee for 1945.

7-8/46. No. 1359. Annual Report of the Branch of Botany and Plant Pathology for 1945, by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A., Senior Plant Pathologist.

7-8/46. No. 1360. Annual Report of Experiments, 1944-45, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager.

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| 11-12/46. | No. 1377. | Annual Report, Division of Entomology, 1945, by J. K. Chorley, Chief Entomologist. |
| 11-12/46. | No. 1378. | Annual Report of Chief Agriculturist, 1945, by D. E. McLoughlin, Chief Agriculturist. |
| 1-2/47. | No. 1383. | Annual Report of Division of Forestry for 1945, by E. J. Kelly Edwards, M.A., Dip. For. (Oxon.), Conservator of Forests. |
| 7-8/46. | No. 1399. | Annual Report of Experiments, 1945-46, Agricultural Experiment Station, Salisbury, by H. C. Arnold, M.B.E., Manager. |
| 7-8/47. | No. 1404. | Report of the Secretary, Department of Agriculture and Lands, 1946. |
| 9-10/48. | No. 1458. | Annual Report of Experiments for 1946-47, Salisbury, Agricultural Experiment Station by H. C. Arnold, Manager. |
| 11-12/48. | No. 1459. | Annual Report of Government Farms by D. E. McLoughlin, Chief Agriculturist. |
| 1-2/49. | No. 1468. | Annual Report, Horticulturist for 1947, by C. N. Hayter, Horticulturist. |
| 7-8/49. | No. 1485. | Summary of Annual Report of Department of Conservation and Extension for 1948, by C. A. Murray, Assistant Director Research and Specialist Services. |
| 7-8/49. | No. 1486. | Summary of Annual Report of Chief Tobacco Officer for 1948, by D. D. Brown, Chief Tobacco Officer. |
| 7-8/49. | No. 1488. | Summary of Annual Report of Chief Botanist and Plant Pathologist for 1948, by J. C. F. Hopkins, Chief Botanist and Plant Pathologist. |
| 9-10/49. | No. 1490. | Annual Report of Experiments for 1947-48, Salisbury Agricultural Experiment Station, by A. G. H. Rattray, B.A. |
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11-12/47. No. 1420. Dark Fire-cured Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Officer.

3-4/48. No. 1436. The Use of Gammexane for the Control of White Grubs and Wire Worms in Tobacco Lands, by A. A. Moffet, Tobacco Research Station, Trelawney.

5-6/48. No. 1443. A Suggestion for the Control of Tobacco Witchweed *(Striga gesnerioides* (Willd) Vatke), by Leguminous Trap-Crops, by H. Wild, Ph.D., D.I.C., Branch of Botany and Plant Pathology.

11-12/48. No. 1460. *Turkish Tobacco in Southern Rhodesia, by D. D. Brown, Chief Tobacco Officer.

3-4/49. No. 1472. Preliminary Notes on Cigar Tobacco Culture, by D. D. Brown, Chief Tobacco Officer.

1-2/50. No. 1504. A Survey of the Fire-Cured Tobacco Industry Conducted During 1949, by J. C. Collins, B.Sc. (Edin.)

3-4/50. No. 1513. Mosaic "Scorch" in Tobacco, by J. C. F. Hopkins, D.Sc. (Lond.), A.I.C.T.A.

5-6/50. No. 1519. A Guide to Prospective Tobacco Growers, by I. C. Collins, B.Sc. (Edin.)

11-12/50. No. 1556. Production of Fire-cured Tobacco, by J. C. Collins, B.Sc. (Edin.)

## VETERINARY.

12/25. No. 570. The Spraying of Bovines, by G. C. Hooper Sharpe, M.C., M.R.C.V.S., and M. H. Kingcombe, M.R.C.V.S.

1/28. No. 666. Notes from the Veterinary Laboratory: Praemonitus —Praemunitus, by Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research.

3-4/42. No. 1197. Laboratory Diagnosis of Disease. Part II. Submission of Specimens, by J. M. Williamson, B.Sc., M.R.C.V.S.

| | | |
|---|---|---|
| 11-12/45. | No. 1326. | *Construction of Dipping Tanks, by B. G. Gundry, A.I.Mech.E., and Notes on their Management, by J. M. Sinclair, M.R.C.V.S. |
| 1-2/46. | No. 1338. | Internal Parasites in Sheep and Cattle, by Percy D. Huston, M.R.C.V.S., Chief Veterinary Surgeon. |
| 9-10/46. | No. 1362. | Carbon Tetrachloride for the Treatment of Liver Fluke and Hookworm, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 9-10/46. | No. 1364. | Tick Transmission of Disease, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 11-12/46. | No. 1374. | Sweating Sickness, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 5-6/47. | No. 1392. | Quarter Evil, by D. A. Lawrence, B.V.Sc., Director of Veterinary Research. |
| 5-6/47. | No. 1397. | Scheduled Diseases of Stock in Southern Rhodesia, by the Veterinary Department. |
| 11-12/48. | No. 1462. | Laboratory Diagnosis of Disease, Preparation of Smears, by J. M. Williamson, B.Sc., M.R.C.V.S., Veterinary Research Department. |
| 11-12/48. | No. 1463. | Tick Transmission of Disease, by D. A. Laurence, B.V.Sc., Director Veterinary Research. |
| 1-2/49. | No. 1469. | African Coast Fever, by Veterinary Department. |

## MISCELLANEOUS.

| | | |
|---|---|---|
| 4/28. | No. 686. | The Land Bank, Its Functions and How it Operates, by S. Thornton. |
| 5/31. | No. 820. | The Great Economic Problem in Agriculture—No. 1, by J. R. McLoughlin, M.Sc. (Economist), Economic Adviser. |
| 9/38. | No. 1081. | Uncontrolled Grass and Forest Fires and their Prevention, by the Rev. Father A. B. Burbridge, S.J. |
| 4/39. | No. 1107. | Some Notes on Game Bird Preservation, by W. E. Poles, Esq., on behalf of the Wild Life Protection Society of Southern Rhodesia. |
| 6/39. | No. 1114. | The Rhodes Inyanga Estate. |
| 9-10/45. | No. 1316. | Post-war Land Settlement in Southern Rhodesia. |
| 11-12/45. | No. 1328. | Baited Fly Traps, by Dr. D. M. Blair, Public Health Department, Salisbury. |
| 11-12/45. | No. 1330. | Control of the Snail Hosts of the Bilharzia Parasites, by Dr. D. M. Blair, Public Health Department, Salisbury. |
| 1-2/46. | No. 1335. | Brick-making on the Farm, by A. C. Jennings, Assoc. Mem. Inst. C.E. |
| 3-4/46. | No. 1344. | Baited Fly Traps (Supplement), by Dr. D. M. Blair, Public Health Department, Salisbury. |
| 3-4/46. | No. 1347. | How to make use of the Fencing Law and Preservation of Farm Beacons, by the Lands Department and L. M. McBean, Surveyor General. |
| 11-12/46. | No. 1371. | Drying of Green Peas, by P. Wissing, Dehydration Officer. |
| 7-8/47.<br>9-10/47. | No. 1410. | *Farming Calendar, by Officers of the Department of Agriculture. |

7-8/47. 9-10/47. No. 1411. Some Hints for Anglers on Fish Pests, by R. M. R. Stevenson, F.R.E.S.

11-12/47. No. 1421. A Start in Book-keeping, by S. M. Makings, Chief Agricultural Economist.

1-2/48. No. 1434. *How to Instal a Simple and Efficient Hot Water Supply on a Farm, by W. A. Welch, Salisbury.

5-6/48. No. 1442. Farm Planning, by K. J. Mackenzie, Senior Extension Officer.

7-8/48. No. 1451. *A Charcoal Safe or Cooler.

9-10/49. No. 1494. Protection of Birds in S. Rhodesia, by R. A. Jubb, B.Sc.

11-12/49. No. 1497. Birds of Prey, by Capt. James, Hon. Ornithologist, Queen Victoria Memorial Museum.

11-12/49. No. 1501. Some Notes on Freshwater Fishes in Southern Rhodesia by R. A. Jubb, B.Sc.

1-2/50. No. 1502. Some Rhodesian Plovers, Dikkops and Coursers, by D. G. H. Plowes.

1-2/50. No. 1507. Some Notes on Fresh Water Fishes in Southern Rhodesia—Part II—by R. A. Jubb, B.Sc.

3-4/50. No. 1510. Some Notes on Fresh Water Fishes in Southern Rhodesia—Part III—by R. A. Jubb, B.Sc.

3-4/50. No. 1512. The Red-Billed *Quelea*—A Problem for Grain-Sorghum Growers, by D. C. H. Plowes.

5-6/50. No. 1516. Some Notes on Fresh Water Fishes in Southern Rhodesia—Part IV—by R. A. Jubb, B.Sc.

5-6/50. No. 1518. Beaks and Their Uses, by Capt. G. L. James.

5-6/50. No. 1523. Native Labour in Agriculture, by V. M. Wadsworth.

7-8/50. No. 1525. Advice to Cotton Growers, by Cotton Research Station, Gatooma.

9-10/50. No. 1542. Some Notes on Fresh Water Fishes in Southern Rhodesia—Part V—by R. A. Jubb, B.Sc.

9-10/50. No. 1545. Herons and Egrets, by D. C. H. Plowes.

11-12/50. No. 1555. Native Labour in Agriculture, by V. W. Wadsworth.

11-12/50. No. 1553. Some Notes on Fresh Water Fishes in Southern Rhodesia—Part VI—by R. A. Jubb, B.Sc.

11-12/50. No. 1552. Angola Rock Thrush, by Captain G. L. James.

# Southern Rhodesia Veterinary Report

AUGUST, 1950.

**General.** With the exception of the Melsetter District the water position was serious with further deterioration in grazing. Cattle continued in fair condition.

**Tick Life.** Tick life was active in the Bulawayo and Gwelo Districts. The following quarantine notices were issued during the month: Salisbury 3, Bulawayo 2, Umtali 2.

## SCHEDULED DISEASES.

1. **African Coast Fever:** Nil.

2. **Theileriosis:** Five deaths occurred in the Salisbury District.

3. **Anthrax:** Inoculation continued in the Bulawayo District.

4. **Foot and Mouth Disease:** Staff seconded for duty in Bechuanaland returned to Southern Rhodesia. No further cases were reported in the Fort Victoria District.

5. **Glanders or Farcey:** Nil.

6. **Heartwater:** Nil.

7. **Lungsickness** (Contagious Pleuro Pneumonia of Cattle): Nil.

8. **Mange in Horses, Mules, Donkeys, and Camels:** Nil.

9. **Pyaemia or Epizootic Lymphangitis:** Nil.

10. **Piroplasmosis:** Confirmed on five farms in the Salisbury and Melsetter Districts and on four farms in the Umtali District.

11. **Rinderpest:** Nil.

12. **Swine Erysipelas:** Nil.

13. **Swine Fever:** Nil.

14. **Quarter Evil:** Cases were reported in all Districts, with several deaths.

15. **Tuberculosis:** Four cattle imported reacted positively to the test in the Bulawayo District. There were two positive reactors to the test in the Umtali District.

16. **Scab:** Nil.

17. **Rabies:** Suspicious reports in the Bulawayo District were investigated. Three cases were subsequently confirmed and a complete "stop order" has been placed on the Gwanda, Insiza, Matobo, Belingwe and Nuanetsi Districts and the Bulalima Mangwe District south of the railway line.

18. **Senkobo Disease:** Nil.

19. **Trypanosomiasis:** There were no further outbreaks in the Salisbury and Melsetter Districts. Block inoculation of all cattle in Urungwe Reserve is under way.

20. **Contagious Epididymitis and Vaginitis** (Epi-Vag): Two new centres were confirmed in the Salisbury District. The disease showed abatement in the Gwelo District.

21. **Lumpy Skin Disease:** Nil.

22. **Contagious Abortion:** Reported in the Bulawayo District.

## SCHEDULED POULTRY DISEASES.

23. **Spirochactosis:** Nil.

24. **Coccidiosis:** Four cases occurred in the Salisbury District.

25. **Fowl Typhoid:** Nil.

26. **Bacillary White Diarrhoea:** Nil.

27. **Tuberculosis:** Nil.

28. **Chicken Pox and Roup:** Two cases of Roup occurred in the Salisbury District.

## OTHER DISEASES.

29. **Gallsickness:** A few cases were reported in the Salisbury, Bulawayo and Melsetter Districts.

30. **Paratyphoid:** Nil.

31. **Horse Sickness:** Nil.

32. **Geilsieke:** Nil.

33. **Biliary:** Nil.

34. **Sweating Sickness:** Nil.

35. **Opthalmia:** Prevalent in the Fort Victoria District with a few cases in each of the remaining Districts.

36. **Screw Worm:** Increasing in the Bulawayo District with a few cases in the Salisbury, Umtali, Fort Victoria and Melsetter Districts.

37. **Coccidiosis:** Nil.

38. **Spirochactosis:** Nil.

39. **Internal Parasitis:** Heavy infestation on a ranch in the Bulawayo District. Very prevalent in the Melsetter District.

40. **Malignant Catarrhal Fever:** Three cases were reported in the Salisbury District.

## POISONING.

41. **Veld Poisoning:** Heavy losses were reported in the Gwelo District, with a few cases in the Salisbury and Melsetter District.

42. **Mineral Poisoning:** Cases were reported in the following Districts:—Arsenical: Salisbury 15, Bulawayo 1, Gwelo 5. Cyanide: Bulawayo 1, Gwelo 4.

**Mallein Testing:** 39 animals were tested with negative results.

**Tuberculin Testing:** 122 animals were tested with negative results.

## IMPORTATIONS.

**Union of South Africa:** Horses 51, Bulls 53, Cows and Calves 74 (breed), Goats 4 (Breed), and Pigs 2 (Breed).

## EXPORTATIONS.

**Portuguese East Africa:** 12 Oxen (Slgtr).

**Northern Rhodesia:** 1 Pig (Breed).

**Union of South Africa:** 9 Pigs (Breed).

## EXPORTATIONS—MISCELLANEOUS.

**Union of South Africa:** 12,623 lbs. Sausage Casings.

**Northern Rhodesia:** 8,817 lbs. ¾ Sides, 5,772 lbs. Middles, 85 Rolls, 1,001 lbs. Hams, 1,487 lbs. Gammon, 3,110 lbs. Cooked Shoulder, 1,629 lbs. Sliced Shoulder, 4,466 lbs. Smalls.

**Belgian Congo:** 417 lbs. Graded Porkers, 96 lbs. Hams, 1,050 lbs. Gammon, 642 lbs. Sausage Casings, 118,650 lbs. ¼'s Beef, 27,301 lbs. Offals and Smalls.

**Bechuanaland Protectorate:** 43 lbs. Middles, 63 lbs. Cooked Shoulder, 159 lbs. Sliced Shoulder, 480 lbs. Smalls.

**Meat Products from Liebigs (Rhodesia) Ltd., West Nicholson:—**

**Belgian Congo:** 13,272 lbs. Corned Beef, 60 lbs. Vienna Sausages, 24 lbs. Curried Beef.

**Union of South Africa:** 32,031 lbs. Potted Meat.

**Portuguese East Africa:** 225 lbs. Vienna Sausages.

J. S. ADAMSON,
Director of Veterinary Services.

# PRICE LIST FOR PINE POLES.

**Untreated.**

**f.o.r. Fairfield Siding.**

Pine Poles are charged at 1s. 6d. per cubic foot.

**STANDARD SIZES.**

| Specification | Price |
|---|---|
| 22′ x 3½″—4″ tips | 4s. 6d. each. |
| 22′ x 2½″—3″ ,, | 3s. 5d. ,, |
| 20′ x 3½″—4″ ,, | 4s. 2d. ,, |
| 20′ x 2½″—3″ ,, | 2s. 8d. ,, |
| 20′ x 1¾″—2¼″ ,, | 1s. 11d. ,, |
| 18′ x 3½″—4″ ,, | 3s. 9d. ,, |
| 18′ x 2½″—3″ ,, | 2s. 5d. ,, |
| 18′ x 1¾″—2¼″ ,, | 1s. 8d. ,, |
| 16′ x 3½″—4″ ,, | 3s. 5d. ,, |
| 16′ x 2½″—3″ ,, | 2s. 2d. ,, |
| 16′ x 1¾″—2¼″ ,, | 1s. 6d. ,, |
| 14′ x 3½″—4″ ,, | 2s. 8d. ,, |
| 14′ x 2½″—3″ ,, | 1s. 9d. ,, |
| 14′ x 1¾″—2¼″ ,, | 1s. 5d. ,, |
| 12′ x 3½″—4″ ,, | 2s. 3d. ,, |
| 12′ x 2¼″—3″ ,, | 1s. 5d. ,, |
| 12′ x 1¾″—2¼″ ,, | 1s. 2d. ,, |
| 12′ x 1″ —1½″ ,, | 0s. 6d. ,, |
| 10′ x 3½″—4″ ,, | 1s. 6d. ,, |
| 10′ x 2½″—3″ ,, | 1s. 2d. ,, |
| 10′ x 1¾″—2¼″ ,, | 0s. 8d. ,, |
| 10′ x 1″ —1½″ ,, | 0s. 5d. ,, |
| 8′ x 2½″—3″ ,, | 0s. 9d. ,, |
| 8′ x 1¾″—2¼″ ,, | 0s. 6d. ,, |

# PRICE LIST FOR GUM POLES.

**f.o.r. Fairfield Siding.**

**Untreated:** 1s. 6d. per cubic foot.

**Treated: Stahdard Charges for Fencing Poles.**

| Specification | | Price | Approx. Weight |
|---|---|---|---|
| **Straining Posts** | 8′ 5″—6″ tips | 5/6 each | 100 lbs. each |
| **Fence Posts** | 6½′ 3″—5″ ,, | 3/0 each | 50 lbs. each |
| **Droppers** | 5′ 1″—1½″ ,, | 30/0 per 100 | 900 lbs. per 100 |
| **Droppers** | 3½′ 1″—1½″ ,, | 20/0 per 100 | 400 lbs. per 100 |

# Rhodesian Milk Records

## OFFICIAL MILK RECORDS.

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Schoongezicht Lonely | Jersey | Jun. 4 years | 5383.00 | 251.22 | 4.67 | 300 | M. W. Burras, Hertford Farm, Box 443, Bulawayo. |
| Vrederust Red-wing | Jersey | Mature | 6528.00 | 332.59 | 5.09 | 300 | |
| Dalham Rosaline | Jersey | Sen. 4 years | 7005.00 | 381.83 | 5.45 | 300 | S. Gelman, 27, Baxendale St., Bulawayo. |
| Dalham Theresa | Jersey | Mature | 7003.50 | 351.88 | 5.02 | 300 | |
| Matopo Utopia | Red Poll | Mature | 9280.30 | 323.59 | 3.50 | 292 | Government Experiment Station, P.B. 19K, Bulawayo. |
| Matopo Vera | Red Poll | Sen. 4 years | 7387.00 | 301.62 | 4.08 | 295 | |
| Matopo Wanda | Red Poll | Sen. 4 years | 6829.80 | 254.42 | 3.73 | 288 | |
| *Criterion Jantje I | Friesland | Jun. 3 years | 10744.00 | 317.05 | 2.95 | 300 | J. Jamieson, Box 217, Bulawayo. |
| *Criterion Spinnekop IX | Friesland | 2 years | 9861.00 | 341.39 | 3.46 | 300 | |
| Katinka Nancy | Jersey | Sen. 4 years | 4865.50 | 230.77 | 4.74 | 300 | J. H. Keightley, Moorfields, Glendale. |
| Leachdale Bactrina | Friesland | Mature | 7522.00 | 263.06 | 3.50 | 300 | Meikles Trust & Invest. Co., Ltd., Leachdale Farm, Shangani. |
| Leachdale Elone | Friesland | Mature | 3316.00 | 124.05 | 3.86 | 267 | |
| Mitchlin April's Angela | Friesland | Jun. 3 years | 6864.00 | 237.38 | 3.46 | 300 | D. Robertson Synd., Ltd., Hilda's Kraal, P.B. 158R, Bulawayo. |
| Mitchlin Lobelia's Celeste | Friesland | Sen. 3 years | 7035.00 | 233.23 | 3.32 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Whinburn Alchemy | Friesland ... ... ... | Mature | 8343.20 | 306.29 | 3.67 | 294 | Major R. R. Sharp, Whinburn, Redbank, Bulawayo. |
| *Whinburn Artful ... | Friesland ... ... ... | Mature | 13485.20 | 501.02 | 3.72 | 300 | |
| Whinburn Balm ... | Friesland ... ... ... | Mature | 9119.10 | 336.03 | 3.68 | 300 | |
| Whinburn Elfin ... | Friesland ... ... ... | 2 years | 8601.50 | 297.63 | 3.48 | 300 | |
| Whinburn Emblem | Friesland ... ... ... | 2 years | 5966.60 | 205.86 | 3.45 | 300 | |
| *Whinburn Sage ... | Friesland ... ... ... | Mature | 13485.80 | 460.87 | 3.42 | 300 | |

* Denotes cows milked three times daily.

## SEMI-OFFICIAL MILK RECORDS

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Drieklip Rietvlei | P.B. Jersey | 2 years | 5161.40 | 248.51 | 4.81 | 300 | Lord Acton, M'bebi, Mazoe. |
| Groot Lorette | P.B. Jersey | 3 years | 4939.60 | 233.24 | 4.72 | 300 | |
| Maureen | G. Friesland | Mature | 7415.60 | 252.39 | 3.40 | 300 | N. G. Barrett, Gavenny, P.O. Box 38, Rusape. |
| Melda | G. Friesland | Mature | 6002.30 | 236.55 | 3.94 | 300 | |
| Dolly | G. Shorthorn | Mature | 9765.50 | 404.15 | 4.14 | 300 | F. J. Barry, Box 209, Umtali. |
| Grand Reef | G. Friesland | Mature | 6909.00 | 248.32 | 3.59 | 300 | |
| Molly II | G. Shorthorn | Mature | 6375.00 | 249.75 | 3.92 | 300 | |
| Queen IV | G. Shorthorn | 3 years | 7212.50 | 262.72 | 3.64 | 300 | |
| Quizzie | G. Afrikander | Mature | 4758.50 | 227.54 | 4.78 | 213 | |
| Joyful | G. Shorthorn | Mature | 5319.10 | 231.46 | 4.35 | 300 | J. H. Barry, Box 209, Umtali. |
| Albert Vale Bokwagen | P.B. Friesland | Mature | 8236.30 | 292.16 | 3.55 | 292 | J. A. Baxter, Glen Norah, Box 1368, Salisbury. |
| Albert Vale Lena XVII | P.B. Friesland | Mature | 9032.50 | 280.17 | 3.10 | 300 | |
| Albert Vale Umpoekoe IX | P.B. Friesland | Mature | 10769.80 | 349.28 | 3.24 | 300 | |
| Barbara | G. Friesland | 3 years | 6001.10 | 226.05 | 3.77 | 300 | R. R. Bennett, P.O. Box 164, Umtali. |
| Jean | G. Friesland | 2 years | 6015.10 | 227.48 | 3.78 | 300 | |
| Razor | G. Friesland | Mature | 6268.00 | 261.02 | 4.16 | 271 | A. Berry, Lendy, P.O. Marandellas. |
| Fanny | G. Friesland | 2 years | 6476.00 | 260.69 | 4.03 | 300 | |
| Juno | G. Friesland | 2 years | 5340.00 | 237.89 | 4.46 | 297 | |
| Makuta | G. Friesland | Mature | 10245.00 | 333.99 | 3.25 | 300 | |
| Dirko May XI | P.B. Friesland | 3 years | 7293.00 | 238.32 | 3.27 | 300 | A. L. Bickle, Box 595, Bulawayo. |
| Dirko Roland's Maandag | P.B. Friesland | 3 years | 6982.70 | 268.76 | 3.85 | 300 | |
| D. 71 | G. Friesland | Mature | 10535.70 | 341.12 | 3.22 | 300 | |
| D. 73 | G. Friesland | Mature | 11612.80 | 378.50 | 3.26 | 300 | |
| D. 97 | G. Friesland | Mature | 9780.50 | 320.74 | 3.28 | 300 | |
| D. 120 | G. Friesland | Mature | 7403.40 | 230.68 | 3.12 | 300 | |
| D. 149 | G. Friesland | Mature | 9203.50 | 314.41 | 3.42 | 273 | |
| D. 222 | G. Friesland | 4 years | 6988.10 | 236.74 | 3.39 | 300 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Destiny IV | G. Friesland | Mature | 7401.50 | 233.81 | 3.16 | 288 | Mrs. M. Black, Burnside, P.O. Bindura. |
| Marty II | G. Friesland | Mature | 6494.50 | 229.98 | 3.54 | 300 | |
| Blackie | G. Common | Mature | 6756.00 | 268.44 | 3.94 | 300 | J. P. Bonnett. P.O. Box 622. Bulawayo. |
| Dirko Jessie | P.B. Friesland | Mature | 9319.00 | 315.93 | 3.39 | 300 | C. Boyd Clark, Mount Zonga, Inyazura. |
| Signora IV | G. Friesland | Mature | 6415.00 | 245.75 | 3.83 | 278 | |
| Truant IV | G. Friesland | Mature | 9418.00 | 296.77 | 3.15 | 300 | |
| Zonga Jess II | P.B. Friesland | 4 years | 8566.00 | 328.69 | 3.84 | 300 | |
| No. 287 | G. Friesland | Mature | 6770.00 | 249.18 | 3.68 | 300 | |
| No. 319 | G. Friesland | Mature | 7618.00 | 278.59 | 3.66 | 300 | |
| No. 402 | G. Friesland | 3 years | 6455.00 | 226.66 | 3.51 | 300 | |
| No. 404 | G. Friesland | 3 years | 5916.00 | 228.16 | 3.85 | 281 | |
| No. 409 | G. Friesland | 3 years | 6467.00 | 245.06 | 3.79 | 300 | |
| Grove Park Ann | G. Friesland | Mature | 7906.00 | 245.92 | 3.11 | 300 | Bradley Bros., P.O. Box 699. Bulawayo. |
| Grove Park Lily | G. Friesland | 4 years | 7993.00 | 261.44 | 3.27 | 300 | |
| Jess | G. Friesland | Mature | 7473.00 | 252.90 | 3.38 | 300 | Miss N. Brereton, Coolmoreen, Gwelo. |
| Netty | G. Guernsey | 2 years | 5940.00 | 228.18 | 3.84 | 283 | |
| Chummy | G. Friesland | 3 years | 6713.00 | 267.91 | 3.99 | 300 | B.S.A. Co. Mazoe Citrus Estate, Mazoe. |
| Rhodesia | G. Friesland | 3 years | 9219.00 | 298.77 | 3.24 | 300 | |
| White II | G. Friesland | Mature | 15787.00 | 523.84 | 3.33 | 365 | |
| No. 22 | G. Friesland | 4 years | 6326.70 | 258.50 | 4.09 | 300 | Col. P. A. Brooke, "Borrowdale-Homestead," P.O. Box 1690, Salisbury. |
| Sunshine | G. Friesland | Mature | 8839.00 | 295.59 | 3.34 | 300 | M. W. Burras, Box 443, Bulawayo. |
| Emily | G. Friesland | Mature | 9138.00 | 308.45 | 3.38 | 300 | L. E. O. Cary, "Clovelly," Trelawney. |
| Janet | G. Ayrshire | Mature | 6400.50 | 261.01 | 4.08 | 300 | |
| Primula | G. Ayrshire | Mature | 6537.50 | 234.75 | 3.59 | 300 | |
| Ruth | G. Ayrshire | Mature | 8100.50 | 281.55 | 3.48 | 300 | |
| Daisy | G. Friesland | 3 years | 5588.00 | 261.87 | 4.69 | 250 | J. R. Clark, Magaragada, Headlands. |
| Shamrock | G. Friesland | Mature | 7446.00 | 264.21 | 3.55 | 300 | T. Cousins, P.B. 20, Gwelo. |

## SEMI-OFFICIAL—(Continued)

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| No. 27 | G. Friesland | Mature | 7431.00 | 239.89 | 3.09 | 300 | Cross & Son, P.B. T.208, Bulawayo. |
| No. 35 | G. Friesland | Mature | 9986.00 | 325.36 | 3.26 | 300 | |
| No. 57 | G. Friesland | Mature | 7847.00 | 249.33 | 3.18 | 300 | |
| No. 91 | G. Friesland | Mature | 7234.00 | 268.63 | 3.71 | 300 | |
| No. 94 | G. Friesland | Mature | 7441.00 | 236.68 | 3.18 | 286 | |
| No. 97 | G. Friesland | Mature | 6975.00 | 250.51 | 3.59 | 261 | |
| No. 115 | G. Friesland | 3 years | 6339.00 | 228.62 | 3.61 | 300 | |
| Bioscope | G. Friesland | Mature | 6130.80 | 225.54 | 3.68 | 300 | A. B. Dobson, Endeavour Farm, Norton. |
| Violet | G. Friesland | Mature | 6848.40 | 230.35 | 3.36 | 300 | |
| Mazoe | G. Friesland | Mature | 7618.90 | 305.84 | 4.01 | 281 | J. N. Duff, Box 3, Marandellas. |
| Sarah | G. Friesland | 4 years | 7176.10 | 247.64 | 3.45 | 300 | |
| Swan | G. Friesland | Mature | 7655.90 | 322.72 | 4.22 | 297 | |
| Queen Mary | G. Friesland | Mature | 6608.00 | 280.77 | 4.25 | 300 | R. I. Edwards, Box 25, Chipinga. |
| Betty I | G. Red Poll | Mature | 5225.00 | 229.71 | 4.40 | 281 | H. J. Elliott, P.O. Box 285, Umtali. |
| Betty II | G. Friesland | Mature | 7121.00 | 248.57 | 3.38 | 294 | |
| Zabron | G. Friesland | Mature | 6277.00 | 251.36 | 4.02 | 232 | |
| Zonga De Grendel Elsa | P.B. Friesland | Mature | 8466.00 | 302.10 | 3.57 | 300 | Mrs. M. Everard, Castle Zonga, Inyazura. |
| Zonga Queen III | P.B. Friesland | Mature | 6556.00 | 286.94 | 4.38 | 300 | |
| Zonga Queen VIII | P.B. Friesland | Mature | 6593.00 | 248.99 | 3.78 | 300 | |
| No. 153 | G. Friesland | Mature | 6252.00 | 234.61 | 3.75 | 300 | |
| No. 164 | G. Friesland | Mature | 6428.00 | 301.48 | 4.69 | 300 | |
| No. 169 | G. Friesland | Mature | 7883.00 | 283.71 | 3.60 | 277 | |
| No. 316 | G. Friesland | Mature | 6841.00 | 264.82 | 3.87 | 300 | |
| No. 318 | G. Friesland | Mature | 7807.00 | 260.69 | 3.34 | 300 | |
| No. 334 | G. Friesland | 4 years | 6642.00 | 229.85 | 3.46 | 287 | |
| No. 378 | G. Friesland | Mature | 7838.00 | 297.74 | 3.80 | 300 | |
| No. 9 | G. Friesland | 3 years | 9545.00 | 372.64 | 3.90 | 300 | Mrs. H. C. Fischer, Olivia Farm, Headlands. |
| No. 13 | G. Friesland | 3 years | 9511.50 | 239.21 | 3.56 | 300 | |
| No. 28 | G. Friesland | 2 years | 9057.50 | 310.12 | 3.42 | 300 | |
| No. 33 | G. Friesland | Mature | 8596.50 | 316.46 | 3.68 | 300 | |
| No. 135 | G. Friesland | Mature | 10709.00 | 386.71 | 3.61 | 300 | |
| No. 151 | G. Friesland | 4 years | 8631.00 | 311.59 | 3.61 | 300 | |
| No. 292 | G. Friesland | Mature | 9931.00 | 400.43 | 4.03 | 300 | |

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|---|---|---|---|---|---|---|---|
| No. 245 | G. Friesland | 4 years | 6943.00 | 253.84 | 3.66 | 300 | R. Le S. Fischer, Wakefield, P.O. Headlands. |
| No. 42A | G. Friesland | 4 years | 5808.00 | 233.97 | 4.03 | 300 | W. F. Fischer, Coldstream Dairy, Headlands. |
| No. 62A | G. Friesland | 3 years | 5793.00 | 245.12 | 4.23 | 300 | |
| No. 68A | G. Friesland | 3 years | 5977.00 | 225.98 | 3.78 | 300 | |
| No. 70A | G. Friesland | 3 years | 5676.00 | 238.71 | 4.21 | 300 | |
| No. 71A | G. Friesland | 3 years | 6359.00 | 237.31 | 3.56 | 300 | |
| No. 79A | G. Friesland | 3 years | 5421.00 | 229.49 | 4.23 | 300 | |
| No. 405 | G. Friesland | Mature | 7933.00 | 257.33 | 3.21 | 300 | |
| No. 449 | G. Friesland | Mature | 5477.00 | 263.80 | 4.82 | 300 | |
| No. 454 | G. Friesland | Mature | 6379.00 | 226.47 | 3.55 | 300 | |
| No. 495 | G. Friesland | Mature | 9453.00 | 344.76 | 3.65 | 300 | |
| No. 499 | G. Friesland | Mature | 6355.00 | 276.13 | 4.35 | 300 | |
| No. 500 | G. Friesland | Mature | 7347.00 | 244.04 | 3.32 | 300 | |
| No. 502 | G. Friesland | Mature | 7698.00 | 282.91 | 3.68 | 300 | |
| No. 512 | G. Friesland | Mature | 6706.00 | 237.17 | 3.53 | 300 | |
| No. 533 | G. Friesland | Mature | 8743.00 | 282.75 | 3.23 | 300 | |
| No. 549 | G. Friesland | Mature | 10715.00 | 343.23 | 3.20 | 300 | |
| No. 569 | G. Friesland | Mature | 7981.00 | 296.95 | 3.72 | 300 | |
| No. 598 | G. Friesland | 4 years | 7506.00 | 305.51 | 4.07 | 300 | |
| April | G. Friesland | 3 years | 7499.40 | 295.90 | 3.46 | 300 | G. J. Franklin & Son, Box 105, Umtali. |
| Augusta | G. Friesland | 2 years | 6563.00 | 261.08 | 3.98 | 300 | |
| Beulah | G. Friesland | Mature | 8755.70 | 323.33 | 3.69 | 269 | |
| Blackie | G. Friesland | 2 years | 6263.20 | 260.00 | 4.14 | 300 | |
| Brindle II | G. Guernsey | 4 years | 9923.20 | 424.52 | 4.28 | 300 | |
| Bubbles | G. Friesland | Mature | 9025.30 | 322.91 | 3.58 | 300 | |
| Bulbul | G. Friesland | Mature | 7487.30 | 301.94 | 4.03 | 300 | |
| Chipinga | G. Friesland | 2 years | 5107.10 | 226.39 | 4.43 | 299 | |
| Cigarette | G. Friesland | 4 years | 10725.00 | 387.90 | 3.62 | 300 | |
| Daisy | G. Friesland | Mature | 11022.60 | 423.71 | 3.84 | 300 | |
| David | G. Friesland | Mature | 7879.90 | 283.59 | 3.60 | 290 | |
| Fern | G. Friesland | Mature | 9724.30 | 434.43 | 4.47 | 300 | |
| Friday | G. Friesland | 2 years | 5750.10 | 252.06 | 4.38 | 289 | |
| Ganganda I | G. Guernsey | Mature | 5949.90 | 287.09 | 4.83 | 260 | |
| Ganganda III | G. Friesland | Mature | 7881.50 | 356.07 | 4.52 | 263 | |
| Gin | G. Friesland | Mature | 8468.70 | 271.76 | 3.21 | 300 | |
| Ginger | G. Friesland | 2 years | 8168.60 | 284.42 | 3.48 | 300 | |
| Ginger Beer | G. Friesland | 4 years | 11380.20 | 454.73 | 4.00 | 300 | |
| Headlands | G. Friesland | 2 years | 8146.50 | 296.94 | 3.65 | 300 | |
| Hospital | G. Friesland | 2 years | 7699.00 | 325.37 | 4.23 | 300 | |
| Juliet | G. Friesland | 4 years | 6244.90 | 277.21 | 4.44 | 291 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Katherine | G. Guernsey | 4 years | 7883.80 | 336.24 | 4.27 | 300 | G. J. Franklin & Son, Box 105, Umtali. |
| Macequece | G. Friesland | Mature | 7840.50 | 313.11 | 3.99 | 300 | |
| Madeline | G. Friesland | Mature | 11114.9 | 357.97 | 3.22 | 298 | |
| Maggie | G. Friesland | Mature | 7364.70 | 292.13 | 3.95 | 271 | |
| Marandellas | G. Friesland | 4 years | 8924.80 | 362.15 | 4.06 | 300 | |
| Mhaka II | G. Friesland | Mature | 5843.60 | 248.82 | 4.26 | 279 | |
| Miranda | G. Friesland | 4 years | 10512.10 | 442.22 | 4.21 | 300 | |
| M'sorro | G. Friesland | Mature | 8106.70 | 312.12 | 3.85 | 260 | |
| Nancy | G. Friesland | Mature | 6454.10 | 301.94 | 4.66 | 277 | |
| Nanny | G. Friesland | Mature | 8086.00 | 328.89 | 4.07 | 277 | |
| November | G. Friesland | 4 years | 5883.70 | 243.02 | 4.13 | 300 | |
| Nutmeg | G. Friesland | Mature | 13332.70 | 495.75 | 3.72 | 300 | |
| Patsy | G. Shorthorn | Mature | 7873.10 | 358.26 | 4.55 | 300 | |
| Pauline | G. Friesland | Mature | 8544.30 | 351.45 | 4.12 | 300 | |
| Phoebe's Jean | G. Friesland | Mature | 11180.50 | 436.65 | 3.91 | 300 | |
| Picanin | G. Friesland | 4 years | 12149.10 | 453.84 | 3.74 | 300 | |
| Rhoda | G. Friesland | 2 years | 7271.00 | 310.67 | 4.27 | 300 | |
| Rodie II | G. Friesland | 4 years | 5494.00 | 238.18 | 4.34 | 300 | |
| Sandra | G. Friesland | 3 years | 5799.50 | 247.35 | 4.27 | 286 | |
| Senara II | G. Guernsey | Mature | 7045.70 | 299.46 | 4.25 | 300 | |
| Socks II | G. Friesland | Mature | 8214.70 | 338.79 | 4.12 | 253 | |
| Sophie | G. Friesland | 4 years | 7456.40 | 234.08 | 3.14 | 286 | |
| Spitfire | G. Friesland | Mature | 7556.70 | 245.76 | 3.25 | 261 | |
| Suund | G. Shorthorn | Mature | 9627.30 | 390.96 | 4.06 | 300 | |
| Tinker | G. Friesland | Mature | 4211.40 | 233.69 | 5.55 | 275 | |
| Victoria | G. Friesland | 2 years | 7536.90 | 325.53 | 4.32 | 300 | |
| Watsomba | G. Guernsey | 2 years | 7062.70 | 331.82 | 4.70 | 300 | |
| White II | G. Afrikander | Mature | 7681.10 | 340.97 | 4.44 | 300 | |
| Xmas | G. Friesland | Mature | 6430.90 | 286.08 | 4.45 | 300 | |
| No. 64 | G. Friesland | 3 years | 5781.60 | 225.94 | 3.91 | 300 | P. Freeland, Lingfield, Gwelo. |
| Whinburn Gavotte | P.B. Friesland | Mature | 8409.50 | 285.21 | 3.39 | 300 | G. G. Futter, Marjoribanks, P.O. Gwelo. |
| Ghenna | G. Friesland | 4 years | 7776.80 | 296.59 | 3.81 | 300 | R. J. Garvin, "Fairview," Umtali. |

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|---|---|---|---|---|---|---|---|
| No. 35 | G. Friesland | Mature | 9326.50 | 323.81 | 3.47 | 300 | S. Gelman, 27, Baxendale Street, Bulawayo. |
| Amy | G. Friesland | 4 years | 7988.00 | 281.76 | 3.53 | 300 | Hon. H. V. Gibbs, P.B. 52L, Bulawayo. |
| Blackie | G. Friesland | 4 years | 7913.00 | 318.87 | 4.03 | 300 | |
| Colleen | G. Friesland | 4 years | 6713.00 | 289.07 | 4.31 | 300 | |
| Glossy | G. Friesland | 4 years | 7357.00 | 251.25 | 3.42 | 300 | |
| Ribbon | G. Friesland | 3 years | 10832.00 | 335.30 | 3.10 | 300 | |
| Snowball | G. Friesland | 3 years | 7336.00 | 237.93 | 3.38 | 300 | |
| Sue | G. Friesland | 4 years | 8476.00 | 262.85 | 3.10 | 300 | |
| Gilda | G. Friesland | 3 years | 5405.00 | 239.58 | 4.43 | 300 | R. Gordon Lennox, "Rakodzi," Marandellas. |
| Jewel | G. Friesland | Mature | 9321.00 | 318.95 | 3.42 | 300 | Government Demonstration Farm, Umshandige, Fort Victoria. |
| June | G. Friesland | 4 years | 8597.50 | 310.71 | 3.61 | 300 | |
| Patches | G. Friesland | Mature | 10403.00 | 393.80 | 3.79 | 300 | |
| Barlow's Vergelegen Marina | P.B. Jersey | 3 years | 5687.00 | 372.36 | 6.55 | 300 | Government Demonstration Farm, Karoi |
| Barlow's Vergelegen Redwing's Diamond | P.B. Jersey | 3 years | 5491.50 | 277.42 | 5.05 | 300 | |
| No. 23 | G. Friesland | Mature | 12207.50 | 418.69 | 3.43 | 300 | Grasslands Experiment Stn., Marandellas |
| No. 94 | G. Friesland | 4 years | 10648.50 | 367.04 | 3.45 | 300 | |
| Greta | G. Guernsey | 3 years | 5145.40 | 250.94 | 4.88 | 300 | D. A. Harley. Harleyton, P.O. Beatrice. |
| Isobel | G. Guernsey | 4 years | 5709.40 | 264.50 | 4.63 | 300 | |
| Olga | G. Guernsey | 4 years | 5340.00 | 249.50 | 4.95 | 294 | |
| Kathleen | G. Guernsey | Mature | 5205.90 | 247.32 | 4.75 | 300 | |
| Joan | G. Friesland | 3 years | 7299.00 | 227.97 | 3.12 | 300 | D. J. Huddy, Box 718, Salisbury. |
| Kay | G. Friesland | 4 years | 9492.50 | 321.41 | 3.39 | 300 | |
| Kitty | G. Friesland | Mature | 6719.00 | 267.55 | 3.98 | 296 | |
| Olga | G. Friesland | Mature | 9824.50 | 347.09 | 3.64 | 265 | |
| Peggy | G. Friesland | 4 years | 6658.50 | 236.25 | 3.55 | 248 | |
| Rosemary | G. Friesland | Mature | 6592.00 | 241.57 | 3.66 | 244 | |
| Vixen | G. Friesland | Mature | 7003.00 | 258.52 | 3.69 | 300 | |
| Winkle | G. Friesland | 3 years | 6796.50 | 238.80 | 3.52 | 279 | |
| Clover | G. Friesland | Mature | 8330.80 | 297.46 | 3.57 | 300 | L. Huddy, Box 924, Salisbury. |
| Helen | G. Friesland | 4 years | 5972.40 | 235.83 | 3.95 | 300 | |
| Joan | G. Friesland | 4 years | 6196.90 | 240.70 | 3.88 | 300 | |
| Pixie | G. Guernsey | Mature | 6295.80 | 226.24 | 3.59 | 297 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Annie | G. Guernsey | Mature | 5077.00 | 244.38 | 4.81 | 249 | Mrs. M. R. Huddy, P.O. Box 899, Salisbury |
| Betty | G. Friesland | Mature | 7285.00 | 262.16 | 3.60 | 300 | J. A. G. Hughes, Bains Hope, P.O. Melfort. |
| Royal | G. Ayrshire | Mature | 7734.00 | 290.41 | 3.73 | 300 | |
| Statice | G. Jersey | Mature | 4549.00 | 236.94 | 5.21 | 300 | |
| Suzanne | G. Friesland | Mature | 7233.00 | 253.04 | 3.50 | 300 | |
| J. 56/2/1 | G. Friesland | 4 years | 9242.00 | 296.18 | 3.20 | 300 | J. Jamieson, Box 217, Bulawayo. |
| J. 105/1 | G. Friesland | 3 years | 11240.00 | 381.66 | 3.40 | 300 | |
| No. 6 | G. Friesland | Mature | 10055.00 | 357.84 | 3.56 | 300 | D. S. Kabot, Box 261, Bulawayo. |
| No. 17 | G. Friesland | Mature | 9174.00 | 309.87 | 3.38 | 300 | |
| No. 25A | G. Friesland | 4 years | 11909.00 | 384.32 | 3.23 | 300 | |
| No. 34 | G. Friesland | Mature | 9010.00 | 332.58 | 3.69 | 300 | |
| No. 39A | G. Friesland | 4 years | 9814.00 | 328.28 | 3.55 | 300 | |
| No. 40A | G. Friesland | 2 years | 5817.00 | 226.60 | 3.90 | 300 | |
| No. 41 | G. Friesland | Mature | 7657.00 | 230.60 | 3.01 | 300 | |
| No. 51A | G. Friesland | 3 years | 9150.00 | 309.01 | 3.56 | 300 | |
| No. 60A | G. Friesland | 2 years | 8293.00 | 266.53 | 3.21 | 300 | |
| No. 85 | G. Friesland | Mature | 9251.00 | 312.15 | 3.37 | 300 | |
| D. 14 | G. Friesland | Mature | 8152.50 | 260.88 | 3.20 | 300 | B. H. Kew, Box 972, Bulawayo. |
| K. 2 | G. Friesland | Mature | 8088.60 | 320.90 | 3.97 | 300 | |
| K. 25 | G. Friesland | Mature | 6488.10 | 226.94 | 3.50 | 300 | |
| K. 28 | G. Friesland | Mature | 11424.30 | 360.89 | 3.16 | 300 | |
| K. 42 | G. Friesland | 4 years | 8028.80 | 247.69 | 3.09 | 300 | |
| Bauhinia | G. Friesland | Mature | 8758.00 | 321.78 | 3.67 | 277 | D. King, Rockwood Farm, Concession. |
| Pickles | G. Friesland | 4 years | 8347.00 | 309.96 | 3.71 | 300 | |
| Zinnia | G. Friesland | Mature | 6043.00 | 257.59 | 4.26 | 270 | |
| Kingston Bandie | G. Friesland | Mature | 8039.00 | 268.59 | 3.34 | 300 | Kingston Farm Syndicate, Box 2, Bindura. |
| Kingston Nipper | G. Friesland | Mature | 8653.00 | 327.58 | 3.79 | 300 | |
| Kingston Odol | G. Friesland | Mature | 6779.00 | 228.77 | 3.37 | 292 | |
| Kingston Option | G. Friesland | Mature | 6702.00 | 271.10 | 4.05 | 300 | |
| Kingston Town | G. Friesland | Mature | 6512.00 | 226.27 | 3.47 | 300 | |

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|---|---|---|---|---|---|---|---|
| Rosandra | G. Friesland | 4 years | 7051.80 | 235.83 | 3.34 | 300 | Mrs. M. M. M. Krahner, Haydock Park Banket. |
| No. 36 | G. Friesland | Mature | 7115.30 | 264.14 | 3.71 | 300 | H. T. Lay, P.B. 107C, Salisbury. |
| Larkhill Eve | G. Friesland | 2 years | 5201.50 | 226.05 | 4.35 | 300 | J. N. L. MacIlwaine, Box 23, Marandellas. |
| Madge | G. Friesland | Mature | 7073.50 | 244.57 | 3.46 | 278 | |
| Whinburn Bubble | P.B. Friesland | 4 years | 7714.00 | 252.17 | 3.27 | 300 | |
| Zonga Queen VI | P.B. Friesland | 4 years | 6746.50 | 254.36 | 3.77 | 300 | |
| Kofman | G. Friesland | Mature | 7648.00 | 263.74 | 3.45 | 300 | J. MacIntyre, Box 58, Shamva. |
| Petal | P.B. Friesland | 3 years | 6882.0 | 243.14 | 3.53 | 300 | |
| Flerrie | G. Friesland | 4 years | 7345.30 | 272.05 | 3.70 | 285 | D. W. Marshall, Alderbury, Box 164, Umtali. |
| Ida | G. Friesland | Mature | 6767.90 | 244.91 | 3.62 | 300 | |
| Lucy | G. Friesland | 4 years | 6055.30 | 234.61 | 3.87 | 278 | |
| Makwin | G. Jersey | Mature | 4836.20 | 266.22 | 5.50 | 300 | Lt.-Col. C. I. F. Maynard, Melfort, P.B. 112C, Salisbury. |
| No. 43 | G. Friesland | Mature | 7751.00 | 244.76 | 3.16 | 300 | J. U. McCay, P.B. J181, Bulawayo. |
| No. 50 | G. Friesland | Mature | 7948.00 | 283.89 | 3.57 | 300 | |
| No. 75 | G. Friesland | Mature | 6389.00 | 236.00 | 3.69 | 300 | |
| No. 116 | G. Friesland | Mature | 8270.00 | 272.50 | 3.30 | 300 | |
| No. 128 | G. Friesland | Mature | 7275.00 | 256.15 | 3.52 | 300 | |
| No. 153 | G. Friesland | 4 years | 7412.00 | 232.08 | 3.13 | 300 | |
| Thibet Park Lindberg Zanna | P.B. Friesland | Mature | 7671.00 | 260.31 | 3.39 | 300 | |
| No. 10 | G. Guernsey | Mature | 7620.10 | 325.94 | 4.28 | 300 | J. H. McLean. Box 161, Gwelo. |
| No. 24 | G. Friesland | Mature | 6466.50 | 229.67 | 3.55 | 300 | |
| Fork | G. Friesland | Mature | 8337.70 | 346.77 | 4.16 | 300 | |
| Stowe | G. Friesland | Mature | 7279.40 | 278.13 | 3.82 | 299 | |
| Surprise | G. Guernsey | 3 years | 5464.10 | 225.91 | 4.11 | 300 | |
| Wanderer | G. Friesland | 3 years | 7645.20 | 266.82 | 3.49 | 300 | |
| No. 2/8 | P.B. Friesland | Mature | 7393.00 | 225.04 | 3.04 | 300 | Meikles Trust & Invest. Co., Ltd., Leachdale Farm, Shangani. |
| No. G. 49/3 | G. Friesland | Mature | 11373.00 | 371.11 | 3.26 | 300 | |
| Charlotte | G. Ayrshire | 4 years | 8522.00 | 301.76 | 3.54 | 300 | R. L. Moffat, Ormiston, Shangani. |
| Circe II | G. Ayrshire | 3 years | 6444.00 | 253.88 | 3.92 | 300 | |
| Daphne | G. Ayrshire | Mature | 7861.00 | 352.01 | 4.48 | 300 | |
| Helen I | G. Ayrshire | Mature | 6282.00 | 227.35 | 3.62 | 280 | |

## SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Warspite | G. Ayrshire | 3 years | 6036.00 | 356.96 | 4.26 | 300 | Commander E. L. Morant, Box 741, Salisbury. |
| Wedza | G. Ayrshire | 3 years | 5670.00 | 268.89 | 4.74 | 300 | |
| Whitehorn | G. Ayrshire | 3 years | 5502.00 | 235.42 | 4.28 | 300 | |
| Witch | G. Ayrshire | 3 years | 6369.00 | 300.38 | 4.72 | 300 | |
| Wren | G. Ayrshire | 4 years | 5034.00 | 266.05 | 5.28 | 300 | |
| Polly | G. Friesland | Mature | 6881.00 | 245.40 | 3.57 | 300 | C. F. S. Morkel, "Two Streams," P.B. Macheke. |
| Merle | G. Guernsey | Mature | 6201.00 | 284.68 | 4.59 | 280 | G. R. Morris, P.O. Box 1040, Salisbury. |
| No. 137 | G. Friesland | Mature | 6706.00 | 232.56 | 3.47 | 300 | P. B. Morrisby, Box 36, Gwelo. |
| No. 152 | G. Friesland | Mature | 9050.00 | 293.59 | 3.24 | 300 | |
| Manyerket | G. Friesland | Mature | 6741.10 | 227.29 | 3.37 | 300 | J. T. Mungle, "Myreside," Odzi. |
| Gramet I | G. Friesland | Mature | 7076.00 | 243.32 | 3.44 | 300 | K. Norvall, Box 637, Bulawayo. |
| Katang | G. Red Poll | Mature | 7050.00 | 242.15 | 3.43 | 249 | |
| Minhinick Petal | P.B. Friesland | 2 years | 8669.00 | 299.72 | 3.57 | 300 | |
| Nazaret II | G. Friesland | 3 years | 5876.00 | 239.39 | 4.07 | 300 | |
| Seaborough Barbara | P.B. Friesland | 3 years | 10327.00 | 328.65 | 3.18 | 279 | |
| Seaborough Colleen | P.B. Friesland | 4 years | 7444.00 | 250.60 | 3.37 | 300 | |
| Windy II | G. Friesland | 3 years | 6258.00 | 232.52 | 3.72 | 292 | |
| No. 55 | G. Red Poll | 4 years | 5796.40 | 238.03 | 4.11 | 300 | J. L. Pakenham, Thornlea Farm, Heany Junction. |
| Edna III | G. Friesland | 2 years | 6887.80 | 226.92 | 3.29 | 269 | E. Palmer, Ferndale, Penhalonga. |
| Norris | G. Guernsey | Mature | 7401.90 | 288.76 | 3.90 | 256 | |
| Shasha IV | G. Friesland | 2 years | 7543.20 | 243.10 | 3.22 | 300 | |
| Socks | G. Friesland | Mature | 6953.80 | 270.37 | 3.89 | 245 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cid's Dame | G. Jersey | Mature | 6163.50 | 360.77 | 5.85 | 300 | Mrs. E. L. Parkes, P.O. Box 159, Salisbury. |
| Dairy | G. Jersey | Mature | 7228.00 | 379.97 | 5.26 | 300 | |
| Domby | G. Jersey | 4 years | 5441.00 | 281.26 | 5.17 | 292 | |
| Samuelle | G. Jersey | Mature | 6458.00 | 324.43 | 5.02 | 300 | |
| Butter Knife | G. Friesland | 2 years | 6446.80 | 268.01 | 4.16 | 292 | J. D. Parsons, P.O. Box 7, Bulawayo. |
| Princess | G. Friesland | 4 years | 6394.70 | 234.70 | 3.73 | 239 | |
| May | G. Friesland | 3 years | 9193.00 | 336.94 | 3.67 | 265 | |
| Pam | G. Friesland | 5 years | 9892.60 | 307.44 | 3.11 | 253 | |
| Margaret | G. Friesland | Mature | 6305.50 | 234.26 | 3.55 | 300 | Rhod. Corp., Ltd., Kent Estate, Norton. |
| Reinera | G. Friesland | Mature | 5991.50 | 264.62 | 4.42 | 300 | |
| Edward | G. Friesland | Mature | 7937.60 | 245.89 | 3.09 | 254 | G. W. Robinson, P.O. Box 346, Salisbury. |
| Gwyman | G. Friesland | 3 years | 8528.20 | 312.83 | 3.67 | 300 | |
| Loppy | G. Friesland | 3 years | 6359.90 | 236.16 | 3.71 | 300 | |
| Nincompoop II | G. Friesland | 4 years | 9331.30 | 351.13 | 3.76 | 300 | |
| Quaker No. 10 | G. Friesland | 4 years | 7208.50 | 262.08 | 3.64 | 300 | |
| Taglia | G. Friesland | Mature | 6340.90 | 239.60 | 3.78 | 275 | |
| No. 14 | G. Friesland | 4 years | 6797.70 | 269.35 | 3.85 | 300 | |
| Bluebell | G. Friesland | Mature | 5810.30 | 284.66 | 4.90 | 300 | Mrs. D. M. Rutherford, P.O. Box 25, Marandellas. |
| No. 14 (Harriet) | G. Friesland | Mature | 6449.70 | 230.38 | 3.57 | 300 | |
| Gillia | G. Friesland | 3 years | 7131.90 | 280.41 | 3.93 | 300 | |
| Blantyre | G. Friesland | Mature | 8329.50 | 280.61 | 3.37 | 300 | W. F. H. Scutt, Maple Leaf, Norton. |
| Daniel | G. Friesland | 3 years | 6824.40 | 247.69 | 3.63 | 300 | |
| James | G. Friesland | Mature | 7378.80 | 278.16 | 3.77 | 300 | |
| Japan | G. Common | 2 years | 6390.70 | 236.68 | 3.70 | 300 | |
| Jim | G. Friesland | 4 years | 9013.60 | 283.84 | 3.15 | 300 | |
| Mahule | G. Common | 3 years | 6138.10 | 266.57 | 4.34 | 290 | |
| Mariko | G. Friesland | 2 years | 5889.30 | 226.64 | 3.85 | 254 | |
| Polly | G. Friesland | Mature | 7759.30 | 269.17 | 3.47 | 281 | |
| Cherry | G. Friesland | Mature | 5760.00 | 228.94 | 3.98 | 300 | L. F. Sheffield, Orange Park, P.O. Macheke. |
| Meadows Nelly 25 | G. Jersey | 2 years | 4288.40 | 239.23 | 5.50 | 249 | S. M. Sinclair, Albany, P.B. Melsetter. |
| Meadows Nelly 24 | G. Jersey | 2 years | 4163.30 | 225.44 | 5.41 | 223 | |
| Stienie | G. Friesland | Mature | 5607.00 | 229.29 | 4.09 | 300 | E. Stanger, Chimbi Source, P.O. Rusape. |
| Battle Rosemary III | P.B. Ayrshire | Mature | 6837.00 | 239.86 | 3.51 | 300 | J. R. Stewart & Sons, Ltd., Battle Farm, P.O. Shangani. |
| G. 44 | G. Ayrshire | 3 years | 6611.00 | 250.21 | 3.78 | 300 | |
| G. 41 | G. Ayrshire | 3 years | 9374.00 | 318.46 | 3.40 | 300 | |

### SEMI-OFFICIAL—(Continued).

| *Name of Cow.* | *Breed.* | *Age.* | *Milk in lbs.* | *B. Fat in lbs.* | *Average % B. Fat.* | *No. of Days.* | *Name and Address of Owner.* |
|---|---|---|---|---|---|---|---|
| Tina II | G. Friesland | 2 years | 6763.00 | 232.49 | 3.44 | 300 | Susman & Newfield, Box 959, Salisbury. |
| S/125 | G. Friesland | 2 years | 6989.00 | 250.78 | 3.59 | 300 | |
| S/131 | G. Friesland | 2 years | 6238.00 | 243.29 | 3.90 | 300 | |
| S/143 | G. Friesland | 2 years | 5427.00 | 244.21 | 4.50 | 300 | |
| S/144 | G. Friesland | 2 years | 5426.00 | 236.93 | 4.37 | 300 | |
| Bandit III | G. Friesland | 2 years | 6461.00 | 250.01 | 3.87 | 300 | E. Tapson Trust, Ltd., Lesapi Falls, Rusape. |
| Beans I | G. Friesland | Mature | 8383.00 | 293.77 | 3.50 | 300 | |
| Betty | G. Friesland | Mature | 8315.00 | 315.14 | 3.79 | 300 | |
| Buhera | G. Friesland | Mature | 6538.00 | 263.12 | 4.02 | 273 | |
| Chichaka II | G. Friesland | 2 years | 7232.00 | 235.99 | 3.26 | 300 | |
| Christina | G. Friesland | 2 years | 7339.00 | 251.32 | 3.43 | 300 | |
| Dodo | G. Friesland | 4 years | 10802.00 | 412.44 | 3.82 | 300 | |
| Gracie | G. Friesland | Mature | 6243.00 | 232.25 | 3.72 | 271 | |
| Janette II | G. Friesland | 2 years | 6426.00 | 304.12 | 4.73 | 300 | |
| Martinonga | G. Friesland | 2 years | 6176.00 | 242.88 | 3.93 | 300 | |
| Miriam IV | G. Friesland | Mature | 10185.00 | 382.28 | 3.75 | 300 | |
| Nazaret | G. Friesland | 2 years | 6862.00 | 258.88 | 3.77 | 300 | |
| Prieska | G. Friesland | 2 years | 6546.00 | 228.14 | 3.49 | 300 | |
| Rowende | G. Friesland | 3 years | 8714.00 | 313.12 | 3.59 | 300 | |
| Sabina | G. Friesland | Mature | 8503.00 | 334.70 | 3.89 | 300 | |
| Stick | G. Friesland | 2 years | 6119.00 | 253.51 | 4.14 | 300 | |
| Japan II | G. Friesland | 2 years | 7253.00 | 261.59 | 3.61 | 300 | |
| Joeburg | G. Friesland | Mature | 7700.90 | 289.50 | 3.76 | 281 | L. Taylor, Box 55, Selukwe. |
| Kafela | G. Friesland | Mature | 6719.50 | 238.40 | 3.55 | 300 | |
| Macombe I | G. Friesland | Mature | 8165.80 | 273.70 | 3.35 | 300 | |
| Baxter | G. Friesland | Mature | 6764.80 | 239.50 | 3.54 | 282 | A. W. Tennent, Kelvin, Headlands. |
| Daisy | G. Friesland | Mature | 6411.40 | 260.91 | 4.07 | 256 | |
| Eva | G. Friesland | Mature | 9393.90 | 314.52 | 3.46 | 300 | |
| Maude | G. Friesland | Mature | 8038.40 | 287.22 | 3.57 | 300 | |
| Nellie | G. Friesland | Mature | 6814.20 | 237.50 | 3.49 | 300 | |
| No. 11 | G. Friesland | Mature | 7609.90 | 277.54 | 3.65 | 300 | |
| No. 24 | G. Friesland | Mature | 5689.80 | 254.66 | 4.48 | 248 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dorika II | G. Red Poll | Mature | 5995.50 | 235.25 | 3.92 | 273 | J. G. Thurlow, Atherstone, Bindura. |
| Marandellas | G. Red Poll | Mature | 6503.00 | 237.05 | 3.65 | 300 | |
| Maricop II | G. Red Poll | Mature | 6494.80 | 240.76 | 3.71 | 300 | |
| Nyagooi | G. Red Poll | Mature | 5275.80 | 232.07 | 4.40 | 231 | |
| Nyasaland | G. Shorthorn | Mature | 6419.70 | 239.46 | 3.73 | 296 | |
| Nancy VI | G. Friesland | Mature | 6881.00 | 254.21 | 3.69 | 300 | P. S. Timms, Chitora, Rusape. |
| Ebony | G. Friesland | Mature | 6866.00 | 252.61 | 3.68 | 300 | R. O. Waldschutz, Mere, Marandellas. |
| Guinness II | G. Friesland | 4 years | 6589.00 | 230.92 | 3.50 | 300 | |
| Meggie II | G. Friesland | Mature | 7149.00 | 246.24 | 3.44 | 300 | |
| Peach | G. Friesland | Mature | 6975.00 | 259.25 | 3.72 | 300 | |

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